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ABSTRACT

A general course in psychology was selected for a study in which a strategy was devised and demonstrated for integrating self-study materials into a program of independent study. A major problem was to maintain a suitable balance of author direction, teacher guidance, and student initiative. Materials offered the students were a set of objectives; a set of sample test questions; a study guide referencing films, audio tapes, lectures, textbook chapters, and journal articles; a programing language; and a set of quizzes and other learning exercises which could be used in booklet form or on a computer system. Most of the learning materials for the course were available in a room set aside for quiet study or small group discussion. Revision of the procedures and materials of the curriculum was continuous throughout the trial sessions, using data on student performance and attitude whenever possible to bring all students to a satisfactory level of achievement. A programing language, FORTRAN (Formula Translating System), and several instructional strategies were implemented for an IBM 360 time-sharing system. It is thought that the experience of this study is applicable to inexpensive curriculum development for self-instruction projects at university level. Appendices include materials relevant to the course and the study. (MF)

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INTEGRATION OF PROGRAMED INSTRUCTION IN AN INDEPENDENT STUDY PROGRAM

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Ann Arbor, Michigan

August 1968

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VII ERIC REPORT RESUME

I. SUMMARY

A strategy was devised for programming self-instruction and independent study, and was tested with curriculum for a general course in psychology. A major problem was to maintain a suitable balance of author direction, teacher guidance and student initiative. The author must prepare guidelines for handling a variety of background and skills without replacing sound student judgment. The instructor must manage the instructional program without inhibiting student initiative. The student should be able to schedule guided study and self-testing at his convenience, converse with other students and a tutor, and execute additional exercises on his own initiative.

In addition to the description of a general strategy, the products of the study include a set of objectives for the introductory course which clearly define for the student the performance expected of him, a set of sample test questions which elaborate on this description, a study guide referencing films, audio tapes and current campus lectures as well as textbook chapters and journal articles, a set of quizzes and other learning exercises which can be used in booklet form or implemented on almost any time-sharing computer system, and a programming language to ease the task of interpretation and revision of a computer-based exercise.

The general design was characterized by iterative, empirical development of procedures as well as materials. Although base-line data are available on student performance and attitude in the introductory psychology course taught at the University of Michigan, comparisons with an evolving curriculum are difficult. The results with students in the experimental classes have been described, and the programming language has been compared with others in the field.

Revision of the curriculum was continuous throughout the trial sessions, using data on student performance and attitude whenever possible to bring all students to a satisfactory level of achievement of all major objectives, and to increase probability of success for future students.

The results demonstrate inexpensive curriculum development for self-instruction projects at colleges and universities.

II. INTRODUCTION

A. Problem

Programmed instruction has not been as widely used as was predicted five to ten years ago. A number of factors could account for the lack of application of this apparently promising technology in higher education. Certainly one of them is the cost of proper materials development and validation. Commercial firms report charges on the order of $10,000 per hour of student instruction when preparing training materials for use in business or industry. College teachers have reported a variety of figures; $1,000 per hour of instruction is not unusual. However the cost does not stop with the personnel time invested in developing materials. One is still faced by handling the individual differences which fall outside the range anticipated by the program.

A second factor is the apparent need to recreate each set of self-instructional materials for each teacher or group of students. Almost without exception users of a programmed booklet wish to change it in ways not conveniently managed within the printed format.

Student attitude has been another factor accounting for the slow acceptance of programmed instruction as a format for self instruction. The problem for the student, especially at the college level, may be characterized as one of too much "control" preestablished by the author. Although he is able to work at his own rate and with rather good information concerning his performance, he is guided in small steps along a particular path with little or no opportunity for his own judgment or choice to influence the content or even the sequence of instruction. Students have complained that it is difficult to skip ahead when the material is familiar, or to review when they question their understanding, or to retrieve information later when a new question arises. Some printed programs attempt to handle this with special formats, footnotes, indexes, etc.; some success has been achieved with the general logic and storage capabilities of a computer. To provide useful options for student use of materials in ways not anticipated in detail by the programmer, it is necessary to develop more flexible formats.

The technology of programmed instruction is built on the assumption that individual student differences will become insignificant if the program is improved through a sufficient number of revisions, and the students are screened in order to exclude those who lack the necessary background and skills. However this orientation is not appropriate for the college teacher or textbook writer concerned with making some advantageous use of programmed instruction and the technology within the current state of the art.

Programming is a strategy for iterative, empirical development of material and need not be restricted to linear sequences. The performance of students can be used as a guide to decide whether to provide considerable option for self selection as well as self pacing of material. That is, the data obtained during empirically oriented development may recommend that, for certain instructional objectives, the student should be allowed to determine in great measure what material he sees, in what order, and with what accompanying exercises. Of course, if the student is to be given this additional control over his learning activities, the lesson designer must consider carefully the performance objectives which are essential and those which are highly desirable, and either build them into the instructional sequence, or represent them to the student as important and highly recommended. In other words, it should be sufficient to give the student detailed information regarding performance expected of him, his progress to date, and the complete set of learning materials necessary to achieving our goals for him.

One should be able to show that increasing student control over the learning material results in a saving of time by the student, greater student satisfaction, and perhaps more appropriate profiles of student skills at the end of instruction. When studies of student controlled learning show a decrement, one must consider carefully whether the student was given sufficient information about the objectives, intended measures of performance, and his current state of mastery.

Another benefit of student control is usually secondary to mastery of the subject matter but often very significant. A self-study program of instruction may develop in the student certain desirable habits of seeking information, asking questions, and in general having a favorable attitude toward scholarly work. If individual initiative and skills of independent work are desired outcomes, greater allowance for student control of learning material seems to be a reasonable technique. In any case, independent study should be explored as a co-ordinate strategy which may prove more efficient and effective than strictly programmed instruction, at least for some populations of students.

B. Scope of the Study

This exploration of the integration of programmed instruction in an independent study program grew out of a number of years of experience teaching the introductory course in psychology at the University of Michigan. It was desired to carefully develop the materials and strategies which seemed appropriate for self-instruction and independent study, and to document procedures for both development and implementation of the techniques. During the period of the study and with the resources available it was not possible to maintain the strict controls necessary for instruction research while still recording the rich data required for development. Exploration and documentation was determined to be a better course of action than research on isolated factors.

Although the study could not be considered a test of specific hypotheses, a consideration of two general statements implicit in the approach to development and documentation of procedures and materials should help clarify the general intent. First, the materials designer assumed (or sought to demonstrate) that most college students will select and sequence programmed units, films and other material for self instruction in a way which is more effective than any single linear curriculum designed for the "average" student. Essential to the plan is a library of well described instructional units and detailed information about specific course objectives, description of performance measures, etc.

Second, the teacher should also avoid imposing his design on each individual's instructional program. Assuming there is already beneficial contact between teacher and student in discussion groups and perhaps individual tutorial sessions, additional teacher hours are better spent in maintaining a well described set of materials and course objectives, than in gathering detailed information about individual performance with which to tailor sequences for each student. Suggested materials should include current lectures on campus and relevant items in the news media and recent professional journals.

No other hypotheses were stated nor can specific conclusions about student-controlled learning be drawn from the study. The interactions among parameters of independent study and other student characteristics are ill defined and very complex. This small-contract study was undertaken to demonstrate successful use of a strategy of self-instruction for one of the large introductory courses at the college level, and to document the procedures for possible adaptation by other writers and teachers, perhaps in other subject areas.

C. Related Research and Development

The term Independent Study is often applied to a process in which students are "turned loose" from some of the conventional course requirements, and encouraged to read on their own, pursue a research topic, or investigate a general problem that crosses subject boundaries (1). In this sense, independent study describes a considerable number of "Honors" programs that are gradually gaining acceptance on the contemporary college scene. The procedures for providing "independence" while maintaining control vary for these honors programs in three ways: the range of selection (is the only option the sequencing of required materials?), the degree of student interaction (does the student make all his own decisions or must he coordinate and compromise with others in seminars and project groups?), and the kind and extent of implicit teacher control (how do social approval and grading criteria influence student effort?).

In conventional situations for college instruction, the student is given lectures which have been prepared for some "average" students and a reading list with only the implied instructions: "Know what is in these materials." His role involves a considerable number of more or less rigid sanctions, but these sanctions are expressed in terms of exposure to lecturers and books rather than achievement of instructional goals. Typically he does a great deal of study on his own or with a few other students, but the strategy of his "independent study" is left entirely up to him. The "Honors" approach attempts to individualize by reducing the sanctions and increasing student-teacher contact, but it tends to leave the formulation of instructional objectives to the student's invention.

In programmed instruction the emphasis is on increased control of the learning process in order to honestly assume the responsibility for student achievement which is consistent with the educator's objectives. Typically writers include in a required instructional sequence every possible step any student might need. Curiously, however, effective control may also be achieved by increasing the autonomy of the student while providing more information about his performance and the desired standards.

In an ideal instructional situation the student is directed toward the most efficient and effective learning strategy consistent with his particular skills and background. A decrease in superficial behavioral sanctions (e.g., required readings and lecture attendance) results in an increase in the individual resources (e.g., interest, background, and specific skills) available for independent study. Mager and Clark (2) have demonstrated the availability and exploitation of these resources.

Independent study should place no bounds on the interaction among students and teachers other than those of efficiency of effective instruction. A question to be considered is how to identify behavioral goals better achieved by student-teacher and student-student interactions than the otherwise more efficient student-material interactions. In other words, how far can a student go working individually with programmed text and individual project, and where should tutorial and discussion enter in? Objectives expressed in the terminology of the affective domain (3) seem likely candidates for interpersonal treatment. In any case, there is no a priori reason to exclude from a program of independent study such media as small group discussions, conversations with instructors, buzz sessions, and the like.

Computer aids (CAI, CBI, CMI, CAE?) are likely to have an important role in a program of independent study under whatever acronym. It should be useful to sort out some of the different names for interactive use of computers for instruction. Computer-assisted or computer-aided instruction (CAI), adopted by IBM in their early writing about instructional systems, is probably the most commonly used acronym at this time, while System Development Corporation and later Stanford University and RCA have used the term computer-based instruction (CBI). Computer-assisted learning and computer-augmented learning have been suggested as being more descriptive of the variety of uses intended to aid the student in the learning process; however the resulting acronym (CAL) introduces further problems due to its use in association with a large, state university, a conversational algorithmic language for interactive computing developed at the Berkeley campus of that large, state university, and a course author language for automated instruction under development at the Irvine campus of the same university.

Other terms have been used to imply a broader range of concern (e.g., computer assisted education or computer augmented instructional systems). Some of the projects with a particular focus on computer use by the teacher handling performance records and curriculum files have used the label "computer-managed instruction" (CMI). This descriptor implies that the student does not receive instruction directly from the computer; various non-computer media are "managed" or scheduled for him by his teacher with the assistance of automatic data processing.

The Educom Task Force on Educational Systems and Technology on occasion has discussed this nomenclature problem but not produced any satisfactory recommendation for the field. Acronyms tend to become associated with one manufacturer, computer system, or research and development project; it is just as well if they are not used to describe the entire field. This study included consideration of a variety of applications including computer assistance in the preparation of materials, the management of instruction, the execution of research, and individual study or research by the student as well as author-directed instruction of the kind usually called CAI.

One of the first concerns for this study is the relation of CAI to programmed instruction. Opinion about "PI" has also suffered as much as "CAI" has from casual naming and inadequate definition. If PI is considered a medium, that is, a format for printed, instructional materials, then it is distinct from CAI as a medium for presenting materials with an electric typewriter or electronic display screen (cathode ray tube) connected to a computer. However, much of the material now available for use with computers looks very much like computerized versions of programmed texts, slides or audio tape. Only some of the computer-based exercises emphasize dynamic interaction, computation or other information-processing functions that are not readily provided by the lesson author in paper-and-pencil format.

If programmed instruction is interpreted not as a medium but as a strategy for development and validation of instructional materials, it is a strategy which may be applied to development of materials in various media such as textbooks, workbooks, laboratories, films, computer-controlled audio-visual materials, simulated environments, and even general-purpose, problem-solving environments.

This review of related research and development concludes with brief summaries of five conversational uses of computers, some of which depend on strategies derived from programmed instruction and others which look like straightforward use of the computer as a tool for computation, text-processing or graphic-manipulation.

Drill, author-controlled tutorial and "dialogue" tutorial. For this kind of computer assistance with student learning it is typical for the author to define objectives and describe the subject matter in considerable detail. Computerized drill strategies have been used heavily in an experiment with initial reading and math curriculum in some of the Palo Alto Schools (4,5) and in language laboratory exercises at the State University of New York at Stony Brook (6). Much of the work done at Penn State and Florida State can be characterized as individualized versions of lecture, text or examination material. This has been called automated tutorial, but the conversation remains very much under the control of the author of the computer program. Computer-based exercises characterized as "dialogue" tutorial appear to encourage additional initiative on the part of the student and to provide suitable rewards. That is, the student may ask questions, direct the discussion to some extent, and construct solutions to problems set for him by the author. Two typical examples of the method concern practice in medical diagnosis (7) and discussion of problem solutions in college physics (8).

Simulation and gaming. These kinds of applications differ from the previous group in that the conversation between student and program and the results he obtains follow from a general model rather than a frame-by-frame specification. In other words, the designer of the learning exercise may not have anticipated in detail each course of action or outcome. This generality becomes possible if the computer program underlying a game or simulation describes a model designed to provide some appropriate reply no matter what the student should type. Such models can also be used in research to provide artificial situations for initial testing of new hypotheses under favorable conditions of control and observation.

Simulations attempt to model some aspects of the real world for study or research. Computer-based games usually place the student in less realistic situations, provide specific payoffs, and introduce competition with other students. Typical applications of both modes are found in elementary school social studies (9), high school career planning (10), and college chemistry (at the University of Texas).

Scholarly aids: information handling, computation and display. Computer tools for the organization and retrieval of information should be as useful to the student as they are to any scholar working with a broad base of information. A number of experimental systems designed to provide such assistance show considerable promise but are still rather expensive; no extensive experiments have been conducted in typical learning situations.

Computation is such an obvious application that it tends to be overlooked by the planner of a computer-based, instructional system. Notable experiments are being conducted at the Massachusetts Public Schools (11), The University of California at Santa Barbara (12), and System Development Corporation (13).

Interactive use of computers has potential for problem solving in all areas including the arts and humanities. Computers are being used increasingly by artists and scholars in connection with musical compositions, creative writing, experimental films and architectural designs. Students from these areas outside science and engineering should be given access to computing capability through well designed study carrels and readily comprehended programming languages.

Computer aids for instructional management. Public schools probably will be able to provide interactive computer assistance to a few "managers" of instruction sooner than they can to each individual student. Knowledge gained through semi-automated handling of instructional materials and performance records will contribute to effective implementation of other interactive uses of computers by students directly. The Oakleaf school project (14) began with much teacher-student contact and a large clerical staff. Gradually the clerical burden is being replaced by computer programs, and the routine contact with students will be taken over by student interaction with computer programs.

Computer-based tools for the author and researcher. Convenient languages are needed for specifying interactive instruction in ways which can be processed by computer programs. A working group established by Educom (Interuniversity Communications Council) is assembling a set of documents which are intended to describe various programming languages and to recommend additional requirements which are not presently met. Some of the systems described in a preliminary report provide capability for interactive composition and revision of materials; the author can change his text, diagrams or learning strategy by typing instructions on a keyboard or by moving a pointer about on a television screen to indicate new arrangements of text or diagrams. Suitable computer programs can also assist with the preparation of a first draft of a teaching sequence and help with data analysis and decisions in research and modification of instructional packages.

Presumably computers will provide some advantage through increased learning and perhaps reduced cost. Criteria for using computers include: 1) processing and evaluation of responses typed or spoken by the student, 2) complex sequencing or selection rules, or self-modifying strategies of instruction, and 3) generation or assembly of new material. There are also some obvious limitations: it is difficult for a computer to process and evaluate the content of essays (15), complex physical constructions and facial expressions. Lack of organization of a subject may make computer presentation difficult where live, individual instruction can be reasonably successful.

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III. METHODS

A. Students

Introduction to Psychology as a Social Science was selected for this study because a statement of objectives, a large test item pool and a library of independent study materials already had been prepared at the University of Michigan. In addition, the course covers a considerable variety of objectives over a range of topics which are less sequentially dependent in relation to overall achievement than those of many other courses, thus facilitating exploration of independent study. Students entering the course vary considerably in general skills, interests and specific preparation. Large enrollments and the intrinsic interest of the subject matter suggest that increased use of individual responsibility for learning might be both efficient and effective in a psychology course.

An independent study program was set up at various times for two sections of an introduction to psychology as a social science, one section of the honors students in the same course, and one section of the senior seminar. In each case the students were advised of the experimental nature of the materials, and counseled to change to another section of the course if they felt the approach would not be consistent with their study habits and expectations. This advice was further supported by selected comments of previous students which were distributed with the course description (see Appendix E).

Advance information about the experimental nature of the section and the opportunity to move out of the group in each case caused some bias in selection of students. Such bias is permissible for this study because the special treatment is put forth as an alternate or perhaps a supplement for other kinds of study. There was no intention to recommend a new strategy for all students and teachers. Some unknown number of students avoided the special sections; about 10% switched to another section or dropped the course, some giving reasons other than the mode of instruction; and about 10% more, at the end of the course, indicated that they now wished they had been in another section.

B. Materials

The course description included a statement of general objectives, discussion of materials and methods, and a note on evaluation. A study guide was maintained to aid in selection of learning experiences, including films, tapes and special lectures as well as readings. A set of items were marked to indicate a minimal introduction to psychology as a social science, but the student was free to select as he wished.

Most of the learning materials for the course were available in a room set aside for quiet study or small group discussion. In effect, the instructor's resource collection was opened up to the students, and it included reference lists, notes on discussion topics, clippings of news stories and magazine articles in addition to books and journals. A bulletin board in the study room served as a center for distribution and exchange of information about the recommended materials and other items which any one student might wish to bring to the attention of others. A file of comments was maintained to accumulate student opinion on recommended items, not only for use of current students but to carry over in summary form for future groups.

A list of terms and issues and a set of quizzes and problem sets were included in the study guide with extra copies in the study room. The list provided direction for study, especially for a survey of psychology, and the quizzes and problem sets were used for self-testing of achievement. In order to provide prompt feedback on quiz performance and recommendations for further reading, the quizzes were coded for computer presentation and available from any terminal on the general-purpose computer system for the campus. Hints and answers were given to the student as he responded to each question, and a total score and diagnostic suggestions as appropriate were printed at the end of the session. A tutor checked the suitability of the computer scoring and suggestions, and answered additional questions of students. Tutors or the instructor read the problem sets and returned comments.

Written reactions and informal papers were recommended for all students and required for some. The intent was to encourage thoughtful consideration of the material and to assure preparation for the discussion meetings. Students were directed to characterize the major point of view, to compare and contrast an item with other materials, to offer personal opinion, and to evaluate the arguments and evidence whenever it seemed appropriate to do so. Some students responded to each item separately and usually in less than half a page; others wrote short commentaries on units of study and group discussion of the topics. Suggestions for other techniques for maintaining an intimate contact with the ideas were welcomed from the students, and in most cases they were allowed as alternates to those described above.

A number of films and audio tapes were available for individual use in the study room. Others were scheduled for group showings to extend the collection of special lectures which were available live. Outlines were prepared to document the recorded lectures and facilitate their use in self study. Often it was possible to get students together for discussion after a group presentation, e.g., meeting in the front of the room after hearing a well known psychologist at a campus lecture.

Small group meetings were encouraged; students met in the study room, the student union, a dormitory lounge and at campus events. Students were "rewarded" for mentioning comparison of ideas with others, argument of issues, critical evaluation, and gripes about course materials, procedures and examinations. A minimum of 30 minutes was scheduled for each student each week in groups of 2 to 4 in order to supplement the exchange of ideas through written reactions and short papers. This occasion for a periodic progress report to the "manager" of the self instruction program prompted students to pace themselves to distribute their study effort throughout the course.

C. Developmental and Validation Procedures

Most of the data collection was part of the regular teaching process: quizzes, class attendance, record of use of independent study facilities, interim tests, final examinations, papers, and student opinion of instruction. The opinion forms are included in Appendix E.

In this developmental project the analysis was not the usual kind found in a research study comparing alternative treatments. For example, the responses of the first few students indicated that the first draft of a study guide and quiz in the area of science and psychology was lacking. Their performance data and expressed attitudes influenced a quick rewrite of the materials and more success was evident in the performance of students who then used the new version. Of course, changes made after all students had passed the unit could not be checked for effectiveness until the new materials were selected by students in a later group, e.g., the following school term.

These techniques were applied to programmed units, self-instruction guides, self-tests in both ditto and computer formats, and computer-based learning exercises. The use of the computer was facilitated by development of a convenient language for programming conversational interaction. Implementation of the language was supported by another contract; staff of this study contributed to the design of the language to assure its suitability for the self instruction project. The language and its uses are described in Appendix B.

IV. FINDINGS

The significant findings of this exploratory study are given in detail in the appendices. The reader will find there a comparison of computer languages for programming self-instruction, a description of an interpretive language which has already been implemented on three or four different general-purpose time-sharing systems, samples of computer programs for psychology with typical interactions between student and program, and a detailed description of the independent study materials for psychology with examples. These findings will be summarized and interpreted in the following paragraphs.

A. Comparison of Languages for Programming Self-instruction.

Some classification is essential because there are over 30 different languages and dialects which have been developed especially for instructional use of computers. Four classes of languages can be characterized which vary from the most simple notation or data format for writing curriculum materials to a procedure-writing language primarily for system programmers preparing new strategies or data formats. Most of the work under the label "CAI" falls inbetween; this study has considered all four classes.

The most straightforward approach to serving some of the needs of an author of self-instruction materials is to provide a format into which he places the test questions or instruction frames he would like to have presented to students. Two formats were devised which present drill exercises or sequence programmed instruction frames according to individual student performance. The author simply prepares a list of questions with associated answers and hints to be delivered to the student according to the standard strategy. The material can be punched on cards (or typed at a terminal) for entry to the computer, or it can be photographed for presentation by slide projector under computer controll. The computer then sequences the material, provides hints on request from the student, provides the right answer when needed, and records performance data for later inspection by the author of the exercise. A sample is given in Appendix C.

Some of the segments of instruction or testing material did not fit any one strategy, and a language was provided for writing frame-oriented testing or instruction. It is similar to IBM's COURSEWRITER but has some additional convenience factors for the author. A sample program is given in Appendix C. Frame-oriented languages may not really represent a different approach; simple languages in this category may be characterized as data formats, and more developed ones may look like the task-oriented languages which are described below.

Whenever one or more authors have a singular problem type, a special language or dialect may be useful. For example, the frame-oriented version of the language described in Appendix B was suitable for quizzes which had been written out in detail in advance, but it lacked facility for generating sample data for student problems and for checking answers in a statistics quiz. A second version of the language described in Appendix B written especially for this purpose was able to eliminate much of the confusion of repetitive coding. The need for a problem-oriented language is determined in part by subject area and in part by instruction strategy.

A second example of a problem-oriented language is given by yet another Michigan language variation which is particularly suited to training skills such as information gathering and decision making needed in medical diagnosis or electronic troubleshooting, (See Appendix B). Examples have been considered for advanced courses in psychology, but not yet prepared for the self-instruction program in the introductory courses.

The preparation of the three or four special languages used in this study was done by using FORTRAN as a procedure-writing language. That is, the computer was instructed to respond to and otherwise assist the author using a language he found convenient; the computer received its instructions from programs written in the "formula translation" language (FORTRAN) used by the system programmer. Other languages may be more suitable for preparing user-oriented languages; MAD/I (Michigan), PL/I (IBM) and TSA (Stanford University) are under consideration. These may prove to be better related to this type of task than the mathematically-oriented FORTRAN.

Most of the work of this study (and many other CAI projects) has been done with frame-oriented languages. This is a most familiar and straightforward approach to using computers. However the writing of many special procedures (or data formats) has not been exploited as much as would be beneficial for the field. Increasing use of computers in large curriculum development projects will require more attention to separate procedure statement and curriculum descriptions in order to achieve necessary economy. That is, a curriculum designer should be able to select a procedure which will allow him to efficiently translate his instructional materials into procedure statements which the computer can interpret.

The languages for writing procedures really are designed for system programmers and perhaps educational technologists specializing in computer applications. Therefore, curriculum projects will continue to be dependent on such persons to produce user-oriented languages (or data formats) which will maximize convenience in curriculum preparation and reduce attention to computer system details which are not part of the learning and instruction system.

B. Problem-oriented Interpreters on a General-purpose System

A rationale for an interpretive language is described in Appendix B along with one version of this experimental language. Three versions of this language met with some success. The coding of psychology lessons in this study was simplified considerably in comparison with initial work using COURSEWRITER and FORTRAN. Interpretive procedures were preferred to compilation because course segments would be tested, revised and tested again without waiting for another computer program to translate the instructions.

Most of the curriculum writing and revision was done using a language which was interpreted directly by the computer. However, when the content and strategy were difficult to represent in the existing languages, a hypothetical notation was devised to permit curriculum writing without concern for the constraints of existing language formats. Initially the notation of the author was translated into one of the available languages by a technical assistant. Where this manual translation was difficult or impossible, the assistant discussed with the author changes in his notation, or asked the system programmer to make changes in the languages.

Those individual notations which survive should determine the characteristics of new languages in the family of interpreters. Writers in the psychology area used three versions: one for computerization of frame by frame instruction, a second for describing somewhat less constrained dialogue, and a third for specifying problem exercises in statistics.

Curriculum writers in history, mathematics, physics and architecture have expressed some satisfaction with the interpretive language capability. New versions are being added to the growing "family" of notations available to authors and the basic concepts continue to evolve.

C. Instruction Materials and Strategies Using a Computer

A diagnostic quiz was prepared for student self-testing on each of 13 units of the course. The compter versions were adapted from the short, dittoed quizzes given to all students in the study guide. In some instances the computerized version did not include additional diagnosis which the student could not have done for himself while scoring his own quiz paper. Other quizzes were more selective and detailed in their diagnosis than is convenient in a printed format. In all cases a computer based quiz eliminated the wait for manual grading and gave the student more important rewards in the form of immediate feedback. A sample quiz is included in Appendix C.

Because of the need for a great number of questions for self-examination, review and remediation on each concept in an independent study program, routines were prepared for generating quiz items from general rules.

In the first section of a quiz on elementary terms and concepts in statistics, data for simple problems were generated using random numbers to change the problem for each student and on each presentation. When a student needed help to achieve a solution, a new problem of the same class was generated for additional practice; a learning session could be continued until the student achieved the right solution without assistance. The second section of the same quiz gave the student practice in the application of statistical principles to experimental design. The computer generated data and varied design considerations randomly or in response to kinds of student errors.

To provide students with laboratory experience inexpensively, a visit to a learning laboratory was simulated at the computer terminal and excerpts are included in Appendix C and D. The purpose was to give the student the impression of being a subject in a series of experiments in human learning. Following the tests the computer directed a conversation about characteristics of experimentation on learning, considering definition, assumptions, problems in measurement etc.

Other applications in the simulation or gaming mode are under consideration. A model of conditioned learning was prepared by a graduate student and might be so arranged that it can be conveniently used by self-instruction undergraduates in psychology. A student is directed to "manage" the behavior of a hypothetical organism in a specified situation. After he has gained some skill in shaping behavior or has discovered the underlying relationships, he is invited to change the parameters or even the logic of the model. Looking at the program or procedure statement on which the simulation is based helps protect against the student gaining the inappropriate impression that the computer faithfully represents behavior in the real world. Furthermore, manipulation of the model introduces the student to a significant use of computers in behavioral sciences.

In spite of improved programming languages and developmental setting, preparation of materials is still a difficult task.

No shortcut was discovered to bypass the empirical procedure for materials development: defining objectives, analyzing the performance and learning tasks, and drafting and revising materials on the basis of student trials. However considerable attention was given to removal of unnecessary hurdles in the path of an author of computer based exercises.

Quiz formats and simple coding procedures were prepared to aid a writer who otherwise had little information about computers or programming. Technical programming assistance was provided to code special routines to accomplish unique and unusual instruction strategies. Computer-based exercises were assembled by adapting already existing materials of suitable format. For example, a potentially useful computer-delivered quiz was derived from a set of conventional quiz papers. The writer scored a batch of papers, underlining key words which he recognized and accepted as part of the correct answer, and marking others which indicated to him that the student held some misunderstanding requiring specific feedback. Considerable information can be drawn from test papers employing a constructed response format.

Ordinarily the logic implicit in this first draft is not very complex and can be represented with arrows and branching rules on the topmost quiz paper. In the same place the writer can reword the questions and add general instructions for accumulating test scores, for allowing extra attempts by the student, and for providing answers. The author need adopt only a few conventions which define the transformation of graded quiz papers into a computer exercise. If more complex computer patterns are desired the author simply writes out a general flow chart or block diagram on another page. The papers and associated instructions are given to a technical assistant who codes the quiz for computer presentation. The result is only a first draft, and often very rough. Typically the author wishes to make changes during his initial test as a student. These changes can be made on-line from the same terminal while the author is working, or prepared later by an assistant on punched cards or paper tape.

When the quiz is ready for the first trial student, the author may arrange to be in or near the room. Further revision should have the benefit of rich data obtained from student attitude and attention, side remarks and perhaps a brief interview afterwards to clarify the computer's record of student performance.

D. Independent Study Procedures and Student Performance

The procedures and materials described in Appendix E were found to be successful in terms of student performance and attitude measured within the independent study situation. Students performed as well or better on selected test items and problem situations as students from other sections of the same course, or students from previous sections taught by the project director. This finding is not offered here as the result of a controlled experiment but suggested as an implication from an exploratory study.

Many factors make detailed consideration of data useless for other than further development of the material. Students were encouraged to correct errors on quizzes and problems; these were checked and then returned. Students were encouraged to work with each other and with acquaintances in other sections of the course; written work often built upon the work of others.

At the close of each term, each student summarized his opinion about the materials and procedures in an evaluation form, (Appendix E). Instructions encouraged candid answers by reminding the student that the instructor would not read the evaluations until grades had been recorded. The evaluation was primarily in check-list form to obtain more information with a minimum of effort for the student. Extra space was provided, and students were encouraged to write additional comments.

All students stated that they would recommend the course, some with reservations for particular students. A prime concern was the necessity of self-discipline and the need to "take the course seriously." Other warnings about the self-study option concern problems of organizing study time, judging value of reading materials, and handling the stress caused by increased freedom and responsibility. It was also mentioned that a student should expect to interact with other students in the course as an important part of developing an understanding of issues in psychology.

Using a 5-point rating scale, most students rated the general value of the course at 2 ("very good"), commenting that you get out of the course what you put into it. Students rated the teacher's effectiveness as "very good", indicating that the wealth of materials and the tutorials (discussion meetings involving several students and the instructor) were the best features of the teaching strategy.

Although the instructor's overall effectiveness was reflected in ratings on most individual characteristics, he was criticized for "remaining too much in the background." There seemed to be a conflict between independent study and the student's expectation of the traditional teacher's role. Students may depend on the teacher for a summary of exactly what information to cover and even for "inspiration."

The following procedures were favored by students: annotated reading lists; optional discussions; student comment on materials; and an open file of reading lists, papers, and clippings. Students feel that the goals of the course, as far as knowledge and comprehension are concerned, should continue to be expressed by the problem set and study guide for each unit. Student opinions varied greatly with respect to the amount of freedom which should be allowed; most students would be satisfied if a core of essential material were required and then additional readings were selected by each student.

In rating the appropriateness of various learning tools and situations for the five major categories of course objectives (knowledge, understanding, analysis and evaluation, synthesis attitudes and interest), model student opinion matched the instructor's purposes. The text provides knowledge of content; outside readings contribute to further understanding, requiring the ability to transfer textbook knowledge to other literature. Lectures and films contribute to favorable attitudes and interest, and provide some information; discussions serve these purposes plus analysis and evaluation. Reaction records and informal papers provide an opportunity for synthesis of knowledge and test one's understanding of the material. Although not of primary importance in fulfilling any single objective, tutorial sessions helped the student direct his work and stimulated the desire to read. Although quizzes and tests were intended primarily for self-diagnosis and assessment, students reported that evaluations helped fulfill all course objectives.

Motivational and selection factors were not separated from characteristics of the materials. Students were encouraged to work and be examined on areas of special interest to them. Although tests and grade assessment included attention to the minimum set of terms and concepts considered essential for a comprehensive overview of psychology (25% or less of the course grade), students were graded for the most part on areas which might maximize the effect of their previous background and aptitudes.

V. Conclusions and Recommendations

A set of programming languages were devised which proved to be suitable for implementation of computer-based curriculum. Techniques were demonstrated which aid authors or curriculum writers in producing a first draft, testing it with students, and revising the course material. The languages, specifications for convenient notation, and the techniques for generating and revising materials have been described at professional meetings of computer scientists and educational psychologists. In addition to publication in the proceedings of these meetings (AERA, IFIP and ACM, 1968) further dissemination will take place through journals such as *Educational Technology* and newsletters of the professional associations (*Educational Psychologist*, *Educational Researcher* and *Communications of the ACM*).

The curriculum developed for the psychology course reflected a trend in computer use away from a sequence delivered by the computer under strict control of the author's program. It appears desirable to view computer-based curriculum as a resource system which makes primary sources of knowledge available to students, along with the necessary tools for information management, self-testing and problem solving. Learning exercises which exploit computer capabilities give students practice in information acquisition and decision making, competitive gaming, or directed problem solving. In general, students can be expected to exercise more control over their learning environment and assume greater responsibility for achievement.

For certain students and instructional objectives the advantages of computerized programmed instruction may be sufficiently greater than non-computer presentation of similar materials to justify the greater cost. For example, some college students taking a required course lack the motivation and even some of the study skills needed for independent study without the aid of a computer.

Although in most instruction situations clever printed formats will do as well as more expensive and less portable on-line systems, computer instruction systems will continue to be used for research and materials development. In addition to recording data in great detail and over long periods of time, they can monitor training devices located in university classrooms, laboratories, libraries and social centers. An opportunity to mix experimental control with real situations should help bridge the gap between contrived laboratory situations and actual application of learning principles in the classroom.

In summary, the programming languages and materials development techniques were found to be reasonably effective for providing a self-instruction program. Student performance, reactions on a confidential opinion form, and recommendations of the procedures to other students suggest that the techniques will be effective in other courses and subject areas. A major reservation that was expressed by students was a need for self-discipline and a serious attitude toward study of the subject.

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APPENDIX A: COMPARISON OF COMPUTER LANGUAGES FOR PROGRAMMING SELF-INSTRUCTION*

Nearly 30 languages and dialects have been developed especially for programming conversational instruction (1) but within this group there are actually only three or four different kinds of languages. Despite the variety, many of the differences between the languages are superficial, leaving some user needs still unmet.

Different users of interactive systems for instruction require different capabilities and convenience factors. Authors of instructional strategies, simulations, or academic games for the computer require a procedure-statement language which is convenient for describing individual lessons or learning situations. Typically an author provides a basic strategy and organization of content which an instructor might later modify in superficial ways. Instructional researchers, who wish convenience when specifying data collection and control of the learning environment, should be able to devise special strategies which switch from one instruction mode to another, accumulating and comparing data on performance of different students.

Computer programmers and system analysts are asked to work in association with authors and researchers to implement new information-processing strategies and system functions for instructional applications. A language for programmers should provide sufficient access to the computer system to allow convenient preparation and revision of user capabilities, and yet not sacrifice operating efficiency of user programs.

There are other users to be considered as well in a computer-based educational system, but this study was primarily concerned with a user who is preparing, testing or managing the use of conversational instruction materials; i.e., the instructor, author, researcher and system programmer mentioned above.

Kinds of Languages

Data for this brief comparison of languages has been drawn from documents in preparation for an Educom project intended to assess how well the needs of various users of conversational instruction systems are being met and to consider common practices in languages and documentation. The study has produced five working documents which concern: 1) use of terms, 2) aspects of languages and systems, 3) summaries of languages, 4) samples of code, and 5) procedures for documentation of programs. The purposes and content of all five documents were summarized and discussed briefly in a recent paper (2).

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* A paper including most of the material in this appendix will be presented by the project director at the ACM National Conference, August 1968. Proceedings will be published by Brandon/Systems Press, Inc., Princeton, N. J.

For this study it was appropriate to group languages in three or four classes according to operational characteristics. Hence, the following paragraphs discuss hypothetical types of languages for programming: 1) presentation of successive frames or items, 2) conversation within a limited context, 3) presentation of a curriculum file by a standard procedures, and 4) data analysis and revision of materials.

Presentation of Successive Frames

The most common application of computers for instruction appears to be an extension of programmed instruction or audio-visual presentation of lectures. It is not surprising that most languages serve this function. They are characterized by convenience for display of text, acceptance and classification of relatively short strings of text typed by the student, automatic recording of performance data, and implicit branching determined by the categorization of an answer or the contents of a counter which is part of the response history.

A tutorial logic programmed in an extended FORTRAN for the PLATO System called CATO (3) is an extreme example of convenience in a language; actually it is a format for linear teaching or testing materials. The instructor's task amounts to little more than placing slides in corresponding slots for question, hint, and elaboration of the answer, and typing the correct answers at a keyboard while the computer presents successive frames of the course on the video display system. Stanford University and RCA have produced procedure statements for which the subject expert provides curriculum files; for example, arithmetic and spelling drill procedures draw the exercises from a file provided by the teacher-author.

DIALOG, a language in preparation by Technomics Corporation in California, has a highly-structured mode for conversational entry of curriculum files into the system. The user selects among alternative formats, enters strings of text which are to be displayed to the student, or enters alternative answers which are to be searched for in the student answers. As increasing control is assumed by the system program, one improves the chances that sufficient information for some conversation with the student will be acquired from the author. Of course this does not assure that the content will be worthwhile or that the student will meet the objectives of the instruction.

The other languages which are characterized by a frame-by-frame presentation allow the lesson designer more flexibility within each frame. The basic elements of each item of instruction are assumed to be a question or problem statement, a set of alternative answers, corresponding actions to be taken in case the student input was categorized as one of the anticipated types, and action to be taken in case the input was not recognized. COURSEWRITER was one of the first languages and is now the most widely used. COMPUTEST was developed independently at the San Francisco Medical Center for the University of California and is interesting because of the ease with which it is used by authors previously inexperienced with computers, and by students in elementary school writing computer-based quizzes for each other (4).

Processing of strings of characters is another difficult problem for these languages. A language (5) prepared for experimental use at the Thomas J. Watson Research Center of International Business Machines (IBM) includes many examples of useful processing routines. Special functions process responses from the student to determine partial correctness and provide feedback to the student which points out what part was right and perhaps what else is needed.

Conversation within a Limited Context

Relatively fewcomputer-based instruction programs of the tutorial variety have been designed to encourage additional initiative on the part of the student and to provide a relevant reply to whatever he may do. Typically the author of such an exercise must provide in the computer program sets of conditional statements which, for any stage of discussion, make the computer reply dependent not only on the student's current inquiry or assertion, but also on the history of the conversation. MENTOR (6) was developed at Bolt Beranek and Newman (BBN) specifically for this kind of exercise. Because history is stored almost automatically, and complex conditional expressions can be written with considerable ease, it is convenient for describing a dialogue which is conditional on the present context and the history of discussion with each student.

ELIZA (7), developed at the Massachusetts Institute of Technology (MIT), is perhaps less convenient for conditional expressions but makes considerable use of list-processing routines to divide a string of characters typed by a student into words and phrases so that the reply can be assembled from elements of the input as well as material prestored by the author. Initially, this language was used for a very clever demonstration of apparent understanding on the part of the computer. More recently, serious instructional exercises have been programmed which similarly include an impression of a personal conversation because the computer is using words and phrases taken from the student input (8).

MINORCA is being prepared at the Harvard project on Interactive Systems for Vocational Decisions to provide capability for programming interaction with a student seeking information needed for vocational decisions. The designers intend to provide much of the string-processing capability of ELIZA and the provision for moving from one context (or "script") to another. The decision frame and calculation mode in PLANIT (9) make it suitable for programming conversation in a less constrained mode. The experimental COURSEWRITER is a good example of a language with sufficient processing capability to do almost anything an author might wish, but much of it with considerable inconvenience. Because of limited storage and awkward computation and decision statements, the programs become very complicated; the assembly-like COURSEWRITER statements must be compiled by an automatic translator or a very careful programmer.

Preparation of Curriculum Files by Standard Procedures

Some languages are suitable for writing strategies which can be applied to various files of content; for example, CATO is an extension of FORTRAN prepared for the PLATO system at the University of Illinois. For some time, system programmers have prepared various teaching logics or basic strategies into which curriculum authors can place their material; the PLATO tutorial logic described earlier is one such example. More recently CATO was used for the preparation of a higher-level language called TUTOR which is somewhat like COURSEWRITER.

Teacher-student ALGOL (TSA) at Stanford University is a version of ALGOL prepared for experimentation with learning strategies on a PDP-1 time-sharing system. The Stanford approach has been adapted by RCA for use on commercial instructional systems as well. Although an author could use ALGOL or FORTRAN directly on any time-sharing system, it is desirable to have conveniently available certain string-processing capability, conventions for display and input, and procedures for handling files. Programming instructionally-oriented procedures requires some combination of computation, string processing and file manipulation.

Data Analysis and Revision of Materials.

Some assistance has been provided for authors on regular systems but much more is needed. An experimental, text-handling system (10) developed at Stanford Research Institute gives authors the facility to compose and edit text using a typewriter and cursor to enter, delete, insert, change and move any size segment from a single character to a lengthy unit of instruction labeled on a summary page.

A computer-based education system should also provide some assistance to the curriculum developer through accumulation and analysis of records of student performance. A special system for response analysis (11) on the PLATO system at the University of Illinois provides general facility for retrieval and review of records on a CRT. The user is able to review a trace of student progress through an instructional sequence, obtain summary statistics at various levels of detail, or even replay at a student console a complete interaction. In the latter case he is able to specify the speed at which he would like to have the conversation played back, for example, at twice the speed in order to go through what the student did, but in one half the time.

Other ways to group languages might represent how they appear to the author, how they are implemented on the computer, or how the material appears to the student. The manner of implementation can have important implications for modification and operating system cost.

Languages on a General-purpose System

Interactive instruction exercises for this study have been programmed on the general-purpose time-sharing system at The University of Michigan with a variety of languages. No one language is sufficiently flexible to handle the great variety of uses of computers for instruction at the college level. However, the study definitely required a language particularly suited for tutorial and dialogue modes of instruction, yet flexible enough for experimentation with aspects of instructional programming on a computer. The ease with which the translator could be modified and the convenience with which the author could draft and revise his material and strategy were considered more important in this developmental setting than computer efficiency during translation and execution.

The first approach to this goal was the extension of an existing compiler through the use of subroutines. An instruction language was implemented quickly and at low cost because it was based on an existing translator and the additions required only modest programming skills. An extension of FORTRAN was produced which is especially appropriate for authors already experienced in computer programming who wish to describe models of complicated pedagogical strategies within their computer-based lessons. The answer-processing capabilities of COURSEWRITER were readily added to FORTRAN; however, the format statements of FORTRAN continue to be less convenient than the simple input and output conventions assumed in COURSEWRITER.

The second approach taken was the development of a simple interpreter which can be applied to files of test and decision rules but stand separate from them. A File-Oriented Interpretive Language (FOIL, see Appendix B), provides a convenient format for inexperienced computer users, with a special advantage over FORTRAN when describing input and output. Potential authors of computer-based learning exercises have been encouraged to adopt their own conventions and define new statement types as convenient for programming their intended instruction strategies. Technical assistants have translated these hypothetical languages into proper statements in FOIL or some other suitable language. However, the suggestions have led to changes in FOIL and sometimes to the preparation of a version of FOIL for a particular topic. Recompilation of the FOIL translator has not been inconvenient, but the statement-definition capability of MAD-I may prove a more suitable means of implementing language variations.

Four Languages Compared

Characteristics of extended FORTRAN and the interpreter based in FORTRAN (FOIL) were compared with two standard languages for programming conversational instruction, COURSEWRITER and PLANIT. A section of the Educom document summarizing programming languages was used as a basis for comparison; only those aspects of immediate concern to the independent study project were considered.

The ability to display instructional material is essentially identical for COURSEWRITER, PLANIT and FOIL. All use one or two character keywords or operation codes to display text on a typewriter or CRT. PLANIT and FOIL provide for displaying the result of a computation. The write and format statements in FORTRAN are much more flexible but less convenient. COURSEWRITER and PLANIT have a special statement to cause a pause in execution for a set period of time.

Means for accepting input from the keyboard are also quite similar. The read statement is explicit in FORTRAN and COURSEWRITER, implicit after certain display statements in PLANIT, and may be explicit or implicit in FOIL. All four languages provide equivalent conventions for erasing a single character or cancelling an entire response; a special counter or register always contains the time the student took to respond to the last question, and may be used in determining strategy. Only COURSEWRITER and PLANIT have a provision to interrupt the student before he finishes his response.

Options for processing responses are similar for all four languages. Routines found desirable in experimental COURSEWRITER were implemented in FORTRAN and FOIL: searching for character strings (keywords) within the student input, matching strings in spits of some erroneous characters, matching a number within numerical limits, and evaluating an expression typed by the student. PLANIT has similar routines although less control is given to the author in determining tolerance.

The ability to identify locations within an instructional sequence is restricted to label fields in COURSEWRITER and FORTRAN, but in PLANIT and FOIL one can also branch to a file line-number or program statement number. Sequencing of instructional material is somewhat more convenient in FOIL and FORTRAN because one can compute the value for a label, the subscript for a variable, and the arguments for a subroutine.

COURSEWRITER is much less adequate in the area of recording and manipulating data. The records are limited to a small number of counters and switches; calculations are restricted to integer arithmetic on two counters at a time.

FORTRAN is the least convenient for typical authors but most flexible for experienced programmers. Each of the other three incorporates some advantage in coding convenience. FOIL interprets indented statements as scope of conditional subprograms; the programmer finds it easy to imbed one question within another. PLANIT has a rather general conditional expression which provides for use of information from previous questions without having explicitly provided for saving the data. COURSEWRITER has a macro capability with which new language facilities can be derived.

FOIL has proved suitable for programming presentation of successive frames or conversation within a limited context. It is convenient for preparation and testing of materials, and addition of new language features can be made quickly and with little cost. The language and its uses are discussed in Appendix B.

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APPENDIX B: FOIL - A FILE-ORIENTED INTERPRETIVE LANGUAGE*

This is an interim report on a project to provide users of a general-purpose, time-sharing systems with capability for exploring conversational uses of computers for instruction. Faculty members in a number of subject areas have used experimental languages to develop conversational programs and investigate the benefits of computer-assisted instruction in the classroom and laboratory using existing time-sharing facilities. Support was provided by UNIVAC Division of Sperry Rand Corporation. The interpreter is operating on a UNIVAC 1108, on IBM 360/67, and a CDC 6600.

A general-purpose system is appropriate for application of computers to college-level instruction. The computer is available for small projects requiring one or a few terminals for which the acquisition of a dedicated system with many terminals is not justified. Some instructional applications take advantage of existing system routines by incorporating them as subroutines. Other lessons are variations of computer programs written for scientific research purposes. Students obtain additional benefits by learning computer skills and developing interests in other computer applications which can be pursued on the general-purpose system.

A special-purpose, instructional language which is easy to learn and convenient to use is necessary to encourage nonprogrammers (subject experts and educational technologists) to participate in the specification and development of instructional programs. Although valuable information on desirable characteristics for an instructional language was extracted from previous experience with COURSEWRITER[1], PLANIT[2] and other systems, the available computer-assisted instruction (CAI) languages were not found suitable for the variety of research and lesson development anticipated. Except for LYRIC[3] which uses a pre-compiler translator written in FORTRAN, CAI languages are generally implemented for a particular computer and are unavailable on other systems except by extensive reprogramming. Lesson authors place various demands on a language and new characteristics are continually being identified and developed. While some users could work within the frame-structure restraints of PLANIT or the limited computational capability of COURSEWRITER, others found these features unacceptable and desired a language which could be more easily adapted to their individual needs.

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*A paper including most of this appendix will be presented by John C. Hesselbart at the ACM National Conference, August 1968. Proceedings will be published by Brandon/Systems Press, Inc., Princeton, N.J.

Rationale for an Interpretive Language

FOIL (File-Oriented Interpretive Language) was developed to provide conversational lesson-writing capability for instructional programmers who have access to a general-purpose, time-sharing system. Programs written in FOIL reside on direct-access files and are processed by an interpreter written in FORTRAN.

FOIL programs are easily modified and revised. A convenient text editor, available on most general-purpose systems, is used when major revisions of the lesson are to be made. However, many errors detected by the lesson author while testing the program are corrected during a pause in execution. The user simply corrects the line of the lesson containing an error and resumes execution. The interpretive mode also eliminates the need for separate translation or compilation of program prior to execution. During lesson operation statements can be entered directly from the terminal with a one-character prefix which causes immediate interpretation and execution.

Additional conveniences resulted from coding the interpreter in FORTRAN. An executable version of the interpreter was available shortly after the project began. Revision of the language and addition of new features and operators is quite convenient; a number of variations of the processor have been prepared. Access to other system software is achieved by providing the interpreter with linkage to existing subroutines. The source code for the processor is relatively independent of the machine and therefore easily adapted to other time-sharing systems.

CAN at the Ontario Institute for studies in Education, TUTOR at the University of Illinois, TEACH at the University of Arizona and CHIMP at the University of Maryland are additional interpreters written in FORTRAN which provide lesson-preparation capability to users of a general-purpose, time-sharing system.

Description of the Language

Programs written in FOIL consist of a series of commands or imperative statements. The statements instruct the FOIL interpreter to present information and questions, accept and process responses typed by the student, and reply appropriately by performing calculations, compiling data on performance, and branching to other segments of the program.

The following seven statements from a FOIL program provide for the presentation of a single question to a student and a response to his answer.

```
TY  WOULD YOU LIKE TO CONTINUE THE EXERCISE?

    ACCEPT

    IF 'NO', GO TO FINISH

    IF 'YES', OK'

         NUM = NUM + 1

         GO TO NEXT

    GO BACK  PLEASE ANSWER YES OR NO
```

The TY or type statement causes the FOIL interpreter to type WOULD YOU LIKE TO CONTINUE THE EXERCISE? to the student. A string of characters is then accepted from the student (specified by the ACCEPT statement) and retained in a buffer for processing. If the buffer contains NO, control is transferred to a statement labeled FINISH (elsewhere in the program, but not shown in the example). Single quotes around the word NO indicate that it is a <u>keyword</u> to be sought anywhere within the student's response. Any answer containing NO is treated as a negative reply from the student and causes a branch to FINISH.

A list of keywords between single quotes is taken by the interpreter to mean equivalence. All student responses containing any one of the equivalent keywords are treated the same. In this example, YES and OK are equivalent keywords. A student's answer containing either word causes the two idented statements following to be executed.

NUM = NUM + 1 increases the count stored under the name NUM. All variables are assumed to be integers and are preset to the value zero. Any algebraic expression can be evaluated by integer arithmetic in the assign statement. After NUM is incremented, a branch is executed to a statement labeled NEXT (not shown in this example).

An answer which does not contain NO, YES, or OK will not be "recognized" by the keyword searches. The next statement causes the message PLEASE ANSWER YES OR NO to be presented to the student just before a branch is executed back to the ACCEPT statement to wait for a new answer. Any message following a GO statement is presented to the student just before the branch is executed. Thus, the last statement in the example is equivalent to the following pair of statements:

```
TY PLEASE ANSWER YES OR NO

GO BACK
```

Type and branch statements occur together often in FOIL lessons and some authors find it convenient to combine these into one statement.

BACK is a predefined variable which always refers to the previously executed ACCEPT statement. It eliminates the need for labeling every ACCEPT. Additional predefined variables (not shown in this example) enable convenient branching to other unlabeled points in a lesson. GO ON causes a branch to the next major segment of the lesson. GO TO HERE + 5 initiates a branch five statements ahead of the current statement.

The following list of constants, variables, expressions, statements and predefined variables provides a readable though terse description of the language.

CONSTANTS

All numerical constants are integers without decimal points.

VARIABLES

A variable name consists of one to six alphabetic or numeric characters. The first character of each name must be alphabetic.

ONE-DIMENSIONAL ARRAYS

An element of a vector or one-dimensional array is denoted by the array name followed by a subscript enclosed in parentheses. A subscript is a positive constant or a variable.

ARITHMETIC EXPRESSIONS

Arithmetic expressions are constructed from constants, variables, subscripted variables and the four arithmetic operators +, -, *, /. Division is in integer mode with truncation of decimal fractions. As usual, multiplication and division are performaed before addition and subtraction but parentheses can be used to group quantities and change the order of evaluation.

LOGICAL EXPRESSIONS

Logical expressions are constructed from: 1) anticipated responses; 2) arithmetic expressions; 3) the six relational operators: >, <, =, ¬=, >=, and <=, representing greater than, less than, equal to, not equal to, greater than or equal to, and less than or equal to, respectively; 4) the logical operators, & for AND, and | for OR; and 5) parentheses which can be used for grouping.

An anticipated response is a logical expression. Two arithmetic expressions separated by a relational operator (e.g. X-Y > 25) constitute a logical expression. In addition, complex expressions can be composed of two logical expressions by connecting them with & or | . Parentheses are used to indicate that a logical operator is to be applied to a grouping of expressions.

TY STATEMENT

TY Message

The string of characters constituting the message is typed on the terminal.

TY #Expression

The arithmetic expression following the pound sign is evaluated and the value is typed on the terminal.

TY *Expression

To use this statement the terminal must be equipped with slide projector control. The arithmetic expression following the asterisk is evaluated to determine which slide is displayed.

ACCEPT STATEMENT

ACCEPT

The interpretor accepts a string of characters from the terminal and retains it in a buffer for processing.

IF STATEMENT

IF Logical-expression, Statement

The statement is executed if and only if the logical expression is true.

IF Logical-expression

The statements following the IF statement which are indented one or two spaces are executed if the logical expression is true. If it is false, the indented statements are skipped over.

GO STATEMENT

GO [TO] Expression [Message]

The characters TO and the message are optional as indicated by the square brackets. The arithmetic expression is evaluated to determine the number of the line to which control is transfered. A statement lable has the value of the line which is labeled. If a message is present it is typed on the terminal just before the branch is executed.

ASSIGN STATEMENT

Variable = Expression [, Expression, ..., Expression]

The variable or subscripted variable is assigned the value of the first arithmetic expression. If additional expressions are present, the variable represents an array and the successive locations in the array are assigned the values of the successive arithmetic expressions.

CALL SUBROUTINE STATEMENT

CALL Name(Argument, ..., Argument)

To use this statement the interpreter must be modified slightly to provide linkage to the subroutine being called. Each argument is a positive or negative integer or a variable. The number of arguments is determined by the subroutine.

STOP STATEMENT

STOP [Message]

The message is optional. If present, it is typed on the terminal before the program terminates.

PREDEFINED VARIABLES AND NAMES

HERE

The value of HERE is the current line number.

BACK

The value of BACK is the line number of the previously executed ACCEPT statement.

ON

The value of ON is the line number of the next statement which is indented no deeper than the previous ACCEPT statement.

BRANCH

The value of BRANCH controls implicit branching when a statement is encountered which is not indented as deep as the immediately preceding statement. If BRANCH equals -1 and a non-indented statement is encountered, control is transfered back to the previous ACCEPT statement. This implicit branch is equivalent to an explicit branch of the form GO BACK. If BRANCH equals 1, an implicit branch is performed which is equivalent to the explicit branch GO ON. If BRANCH equals zero, no branch is performed and the next statement in the lesson is executed. BRANCH is preset to 1 but can be changed at any point in a lesson.

TIME

The value of TIME is the number of minutes since the student began the lesson.

RPTIME

RPTIME is the student's response time in seconds and is reset automatically after each response.

TRACE

If TRACE is set to 1, the line number of each line is typed on the terminal as the line is executed. TRACE is preset to zero.

RANDOM

RANDOM is the name of a function requiring two arguments which may be used in arithmetic expressions. RANDOM.(X,Y) assumes the value of an integer randomly selected between X and Y. The arguments are positive or negative constants or variables but the value of the first must be less than the value of the second.

NUMBER

NUMBER is the name of a function which retrieves a number from the student's response. NUMBER.(N) assumes the value of the N(th) integer in the previous student response. If the response contains no digits the function returns the value -9999.

Lesson Preparation and On-line Testing

Instructional programs or lessons are prepared by lesson authors and entered into files in the computer. Lesson descriptions may be punched on cards or entered directly from a terminal. A lesson author may conveniently test his program by executing it in the role of a student, noting deviations from the program's intended behavior and making corrections immediately using editing capability within the interpreter. A trace mode is available which aids the author in identifying points where errors occur by displaying the line number of each statement as it is executed.

At times the author may interrupt normal execution by typing a special character (@) and provide a statement for immediate interpretation which displays the current value of a variable or branches to a new segment of the lesson to resume testing. For example, if the author types @GO TO START control will transfer to the line in the lesson labeled START; @TY #VAR will display the current value of the variable VAR; @TRACE = 1 will initiate the trace feature. In fact, the author may enter any FOIL statement for direct execution by preceding the command with an attribute sign (@). When he wishes to store the statement (and not execute it right away), he follows the attribute sign by a line number FOIL statement (e.g. @21 GO TO HERE + 6). An input from the author will replace the specified line of the lesson to take effect on the next occasion for execution.

A variety of instructional programmers have found FOIL a convenient language for the preparation and execution of interactive programs. Materials have been developed for student use in history, biology, statistics and physics as well as psychology. Instructional strategies utilized include problem-solving exercises in error analysis and diagnosis, quizzes and examinations, and a simulation of an ecological system.

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APPENDIX C. SAMPLE COMPUTER PROGRAMS FOR PSYCHOLOGY

Quiz Format (QUIZK)

Drill Strategy (DS1)

Programmed Learning Strategy (PLS2)

Simulated Laboratory Visit

Trouble Shooting

Quiz Format (QUIZK)

Given a set of multiple-choice questions, hints and answers (on transparencies) and an answer key (typed at the keyboard), present and score a quiz. Present prepared replies for each answer chosen, whether explanation of a correct choice or explanation of a wrong one. Do not permit a student to continue until he has selected the correct answer, or asked that the answer be given to him. Present general hints on request. Accumulate number correct on the first try, number of hints requested, and number of answers requested. Report performance on request, and at the end of the quiz.

Q= question number (increased by 1 each time a new question is given)

T= number of tries on current question (reset to 0 each time a new question is given)

TT= total number of tries for all questions

C= number of questions correct on the first try

QPC= questions per film load (here assuming 80-frame device, e.g., Carousel cartridge)

N= number of questions (or answers in the KEY)

K= number of alternatives for each question

KEY (Q)= correct alternative for question Q

R= current response of student

H= number of times a hint was requested

A= number of times an answer was requested

RETURN is to the preceding "ACCEPT"

```
START   "Proctor:  How many alternatives (2 to 7) for each question on this
        quiz?"

        ACCEPT K

        "Proctor:  How many questions?"

        ACCEPT N

        "Proctor:  Enter the key for this quiz."

        ACCEPT KEY(1),....., KEY(N)
        "Proctor:  Load the cartridge, advance the paper and tear off the key.
        Signal to begin."

        ACCEPT

        QPC= 80/(N*(K+2)); Q=0

NEXT    Q=Q+1

        If Q=QPC

           "Proctor:  Change cartridge, then signal to continue."

           ACCEPT


        T=0

        TYPE "Q", Q; SLIDE (Q-1)*(K+2)+1

        ACCEPT R; T=T+1

        If R≥1 and R≤K

           SLIDE (Q-1)*(K-2)+R+1

           If R=KEY (Q)

              "Correct"

              If T=1, C=C+1

              If Q=N, GO TO END

              GO TO NEXT

           "Try again."  RETURN

        IF R= "ANSWER"; A=A+1; SLIDE (Q-1)*(K+2)+1+KEY(1); GO TO NEXT

        IF R= "HINT"; H=H+1; SLIDE (Q-1)*(K+2)+(K+2); RETURN

        IF R= "SCORE"; T=T-1; Q=Q-1; SCORE: [Type "On   I  "Question , You
        made a total of " TT " attempts.  You needed" N " Hints, and "A "
        answers.  You were correct on your first try"C "times."] GO TO NEXT

        "Not recognized; try again." RETURN


  END   [SCORE]
        ACCEPT
        GO TO START
```

DRILL STRATEGY I (DSI)

Given a pool of items, drill the student on a continually changing subset drawn from the pool. Give more practice on those items which the instructor designated as probably more difficult, and on those which the student misses more often. Continue practice until all items meet the performance criterion.

The program is particularly suited to experimentation on paired-associate learning strategies.

N = number of ITEM's (questions or problems).

I = counter for ITEM, ANSWER, and WEIGHT

ITEM(I) = a set of questions or problems provided by the author-instructor, I = 1 to N.

ANSWER(I) = right answers associated with ITEM(I).

WEIGHT(I) = weights associated with ITEM(I) and used to determine the the probability of presentation of ITEM'S: usually larger for difficult ITEM'S.

RESPON = student response to an ITEM.

J = counter for SUBLST.

SUBLST(J) = the names of ITEM'S currently being practiced by the student.

INXUSE = the number of ITEM'S the student practices at one time; maximum value of J.

UNUSED = number of ITEM'S which have not yet been used, i.e., put on SUBLST.

MIN = minimum number of ITEM'S which may make up SUBLST.

LIM = limit placed on the sum of weights of ITEM'S on SUBLST which actually are in use.

DWEIGT = change ("delta") in the weight due to right or wrong answers, usually increased WEIGHT(I) for an individual student as a result of an error on ITEM(I).

MWEIGT = maximum weight an ITEM may have in the determanation of the probability of being presented.

```
Declare integer arithmetic and space for 100 ITEM'S

REQUEST:  DISPLAY "Proctor:  Enter parameters, ITEM'S, ANSWER's, WEIGHT's"

ACCEPT N, INXUSE, LIM, DWEIGT, MWEIGT, MIN, (ITEM(I), ANSWER(I), WEIGHT(I),
          FOR I = 1, N)

(INitialization)

UNUSED = N

Put the names of the first INXUSE ITEM'S onto SUBLST, AND reduce the
count of the remaining unused ITEM'S:
UNUSED = UNUSED - INXUSE

SELECT:  I = ITEM name selected at random from SUBLST, considering each
          ITEM(I) in proportion to WEIGHT(I) modulo MWEIGT; exclude
          ITEM last asked, (See Notes on Implementation for detailed
          explanation).

DISPLAY ITEM(I)

ACCEPT RESPON

     IF RESPON = ANSWER(I),

          DISPLAY "CORRECT"

          WEIGHT(I) = WEIGHT(I) - DWEIGT

          IF WEIGHT(I) > 0, GO TO SELECT

          IF UNUSED > 0,

               Replace name of ITEM in $j^{th}$ position of SUBLST with
               the name of the next unused ITEM:
               SUBLST(J) = N - UNUSED + 1

               UNUSED = UNUSED - 1

               GO TO SELECT

          Replace name of ITEM in $j^{th}$ position of SUBLST with the name
          of ITEM in last position, and decrease maximum value of J by 1:
          SUBLST(J) = SUBLST (INXUSE)
          INXUSE = INXUSE - 1

          IF INXUSE < MIN, DISPLAY  "END OF DRILL SESSION", GO TO REQUEST

          GO TO SELECT

     DISPLAY  "WRONG", WEIGHT(I) = WEIGHT(I) + DWEIGT, GO TO SELECT
```

Notes on Implementation

Selection of I:

To select I, a random number between 1 and LIM is generated. Then, starting with the weight of the ITEM whose name is found in SUBLST(I), the weights of the ITEM'S whose names are found in sequentially increasing elements of SUBLST are added. (The weight modulo MWEIGT is added, rather than the actual weight). Each time a new weight is added the sum of the weights is compared with the random number. If the sum is less than the random number, the procedure takes the ITEM named by the next SUBLST element and repeats itself. Otherwise I is set equal to the name of the ITEM whose weight was last added to the sum. (If, in adding up the weights of all ITEM'S, the sum is still less than the random number, then J, the subscript for SUBLST, is set equal to 1, the weight of the ITEM named in element 1 is added in again, and the summation continues). In the summation process provision is made to skip over the ITEM which was last asked.

The number of ITEM names found in SUBLST will always equal INXUSE, except when no unused ITEM'S remain to replace those removed from SUBLST. The ITEM'S which are actually considered for selection will depend on the value of LIM, and the weights of the ITEM'S in SUBLST. For example, if SUBLST consists of ITEM'S, which have large weights in relation to LIM, the sum of weights might exceed LIM before the latter ITEM'S in the list have been considered.

A bais in the selection of ITEM'S is also possible: If LIM had been given a value equal to the sum of the original weights of the ITEM'S first put on SUBLST, and if the student correctly answered the first few ITEM's (which would reduce their weights), then generation of random numbers between 1 and LIM would bais the selection in favor of ITEM'S found early in SUBLST. This would happen because a large random number could be greater than the sum of the remaining weights, so that the sum would not exceed the random number until one of the first ITEM'S was added into it for the second time.

Modulus Division:

In the random selection of an ITEM, each weight modulo MWEIGT is added to the sum for comparison with the random number. Whenever a student misses an ITEM its weight increases; and there is no limit on the maximum size a weight may attain. Using modulus division does not change an ITEM'S weight, but it does put an upper limit (MWEIGT) on the size of the weight which may be added into the sum.

This procedure increases the probability of selection of an ITEM repeatedly being missed, up to the point where its weight equals MWEIGT. If the ITEM'S weight increases slightly beyond MWEIGT, its probability of selection decreases markedly, because modulus division on the weight then results in a much smaller number than MWEIGT. The reason for using modulus division is that an instructor might want a student to see more of an ITEM he is missing, up to a certain point. After that he would like to temporarily decrease its occurance, so that the student could spend more of his time on other problems.

As an alternative to modulus division, an instructor might prefer to increase the probability of seeing an ITEM missed repeatedly, up to a certain point; but keep it constant after that. This could be done by letting the ITEM'S weight increase to MWEIGT, but then remain there if it continues to be missed.

Sequential Repetition of ITEM'S:

The programs use a variable named "LAST" to insure that the same ITEM is not asked twice in a row. If the statements with LAST in them were eliminated, the programs would allow successive repetitions of the same question.

Length of Variable Names:

The variable names were kept within 6 characters, because several of the languages limit variable names to this length. Name lengths can be greater in the following languages: PLANIT , COMPUTEST, MAD and PL/1.

PROGRAMMED LEARNING STRATEGY (PLS2)

Given: a file of M sets of items (probably corresponding to successive "concepts" to be mastered): N items or frames in each set; T test items or frames included at the end of each set; performance data for the current student including percent correct and successive numbers correct and incorrect.

Present to the student: a succession of items until mastery has been demonstrated on all concepts, or review and diagnostic procedures have failed.

The first item is the first test frame (J=N(1)-T(1)+1) in the first set (I=1). Thereafter, I (the set number) and J (the frame number) are adjusted by the following procedure:

```
IF J is test frame
  IF J is correct
    J = J+1
    IF J > N;  I=I+1;  J=N(I)-T(I)+1;  RETURN
    OTHERWISE, RETURN
  OTHERWISE (i.e., J not correct)
    IF I not traversed; (i.e., row I has not been seen)
      J=1
      RETURN
    IF I-1 not traversed; I=I-1;  J=1;  RETURN
    IF here before:  GO TO HELP (a special routine)
    OTHERWISE;  J=(N-T)/2;  RETURN  (i.e., review last half of concept row)
  OTHERWISE  (i.e., a teaching frame)
  IF last A are correct (i.e., count of successive correct)
    J=N(I)-T(I)+1
    RETURN
  IF last B incorrect
    IF I-1 not traversed;  I-I-1;  J=1;  RETURN
  OTHERWISE;  J=J+1;  RETURN
  OTHERWISE
    IF J+1 is not test frame;  J=J+1;  RETURN
    IF correct/(N-T) ≥ X;  J=J+1;  RETURN
    IF here before;  GO TO HELP
    OTHERWISE:  J=(N-T)/2;  RETURN
END OF PROCEDURE
```

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SIMULATED LABORATORY VISIT

```
        1     $RUN FOIL+*SSP;1=*MSOURCE* 2=*MSINK* 6=MARYANN
        1.1   $SOURCE=*MSOURCE*
      998
      999
     1000      FRAME   1
     1001
     1002     .
     1003       TRY TO REMEMBER THESE PAIRS.
     1004          JIC    MEC
     1005          VUH    DCY
     1006          121    457
     1007          BON    SYN
     1008          GEF    XUM
     1009        TYPE "READY" TO BEGIN.
     1050        "READY"
     1051          IF R>=6, GO TO LINE 6132
     1052          SV X=RANDOM.200,699
     1053          SV X=X/100
     1054          GO TO FRAME X
     1100        ""
     1101          TY TYPE "READY" TO BEGIN.
     1102          JIC
     1150        "MEC"
     1151          SV R=R+1
     1152          GO TO LINE 1051
     1200        ""
     1201          TY WRONG   JIC   MEC
     1202          SV R=0
     1203          GO TO LINE 1051
     1998
     1999
     2000      FRAME   2
     2001
     2002        VUH
     2050        "DCY"
     2051          SV R=R+1
     2052          GO TO LINE 1051
     2100        ""
     2101          TY WRONG.   VUH   DCY
     2102          SV R=0
     2103          GO TO LINE 1051
     2998
     2999
     3000      FRAME   3
     3001
     3002        121
     3050        "457"
     3051          SV R=R+1
     3100        ""
     3101          TY WRONG   121   457
     3102          SV R=0
     3103          GO TO LINE 1051
     3998
     3999
```

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```
4000       FRAME    4
4001
4002          BON
4050          "SYN"
4051            SV R=R+1
4052            GO TO LINE 1051
4100          ""
4101            TY  WRONG.  BON    SYN
4102            SV R=0
4103            GO TO LINE 1051
4104            DEF
4150          "XLM"
4151            SV R=R+1
4152            GO TO LINE 1051
4200          ""
4201            TY WRONG DEF    XLM
4202            SV R=0
4203            GO TO LINE 1051                                   ASSOCIATES.
4204            TY THAT'S SIX IN A ROW CORRECT.  READ ABOUT PAIRED-
4205            TY AND GO ON TO THE NEXT TASK.
4206            GO TO FRAME 7
4998
4999
5000       FRAME    5
5001
5002        READ 3.1 OF TEXT ABOUT CONCEPTS
5003       START BY USING TEST CASES OF 12 LETTERS.
5004       TYPE "RULE" WHEN YOU ARE READY TO STATE
5005       THE CRITERIA FOR THIS SIMPLE CONCEPT.
5050       /RULE/
5051            GO TO FRAME 8
5100         /XX,XX,OO,OO,OO,A/7
5101            TY RIGHT.  TYPE "RULE" TO DEFINE THE CONCEPT.
5102            GO BACK
5150         /X,X,X,X,Z,ZB/7                                             BUT
5151            TY YOU HAVE THE CORRECT NUMBER FOR EACH OF THE LETTERS,
5152            TY THE CORRECT ARRANGEMENT.
5153            GO BACK
5200         /X,X,X,X,O/5
5201            TY YOU HAVE THE CORRECT NUMBER OF X'S.
5202            GO BACK
5250         /Z,Z,O/3
5251            TY YOU HAVE THE CORRECT NUMBER OF Z'S
5252            GO BACK
5300         /O,O,O,O,O,O,E/7
5301            TY YOU HAVE THE CORRECT NUMBER OF O'S
5302            GO BACK
5350         /Z,Z,Z,F/4
5351            TY YOU HAVE TOO MANY Z'S
5352            GO BACK
5400         ""
5401            TY TOO BAD...TRY AGAIN
5402            GO BACK
5998
5999
```

```
6000        FRAME   6
6001
6002        STATE THE RULE FOR THIS CONCEPT.
6050         /2 Z,4X,6C,TWO Z, FOUR X, SIX C, PAIRS, TWO/4
6051            TY VERY GOOD




6052            GO TO FRAME 9
6100         /PAIRS,TWO,2/
6101            TY YOU HAVE DESCRIBED THE RIGHT ARRANGEMENT,
6102            TY BUT THE NUMBER OF EACH LETTER IS NOT
6103            TY CORRECT. TRY ANOTHER TEST CASE.
6104            GO TO FRAME 7+3
6150         /2Z,4X,6C,TWO Z,FOUR X,SIX C/3
6151            TY YOU HAVE THE RIGHT NUMBERS BUT THE ARRANGEMENT
6152            TY IS NOT CORRECT.  TEST HYPOTHESES ABOUT ARRANGING
6153            TY THE LETTERS.
6154            GO TO FRAME 7+3
6200          ""
6201            TY YOUR RULE DOES NOT AGREE WITH MINE.  TRY
6202            TY ANOTHER TEST CASE.
6203            GO TO FRAME 7+3
6204          FRAME    9
6998
6999
7000        FRAME   7
7001
7002          READ TEXT 4.1, AND ANSWER THE QUESTION POSED.
7003          IS THE TRAVEL TIME GREATER, LESS, OR THE SAME AS THE WIND-↓
                                                                 LESS TRIP?
7050          /GREAT, MORE/1
7051            TY  GOOD. YOU HAD THE INSIGHT TO SEE THAT THE TIME SPENT
7052            TY TRAVELING FROM AMSK TO BCPSCK WAS LESS, AND THAT THE
7053            TY WIND WOULD HAVE AN OVERALL RETARDING EFFECT.
7054            GO TO FRAME 10
7055            GO1 BACK  NO OTHER INFORMATION IS NEEDED.           50 MPH.
7056            GO2 BACK SEE TEXT 4.2.  PLANE SPEED IS 200 MPH. WIND AT↩
7057            GO3 BACK CONSIDER THE TIME SPENT TRAVELING BETWEEN CITIES
7058            GO4 BACK  SEE TEXT 4.3 FOR A SAMPLE SOLUTION          SPEED
7059            TY5  INSIGHT TELLS YOU THAT THE TIME WHEN THE PLANE IS↩
7060            TY5 IS BOOSTED IS SHORTER THAN THE TIME WHEN THE WIND IS↘
                                                                    AGAINST
7061            TY5 THE PLANE.
7998
7999
```

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```
8000      FRAME   8
8001
8002      ASK PROCTOR TO SET UP TABS, AND
8003      FASTEN AGAIN FOR THIS EXERCISE.
8004      READ TEXT 1.1
8005              KEY
8006              BOAT
8007              MUSIC
8008              CODE
8009              CLEAN
8010              SCIENCE
8011          KEY....AND SO FORTH
8012      NOW YOU TRY IT.
8013              KEY
8050        /BOAT/
8051          IF RPTIME>10, TY OK, BUT TOO LONG.
8052          SV R=R+1
8053          IF R>=6, GO TO FRAME 15 + 105
8054          IF RPTIME>10, TY TOO LONG.
8055           TY BOAT
8056          SV R=0
8100        /MUSIC/
8101          IF RPTIME>10, TY OK, BUT TOO LONG.
8102          SV R=R+1
```

```
8103          IF R>=6, GO TO FRAME 15 + 105
8104          IF RPTIME>10, TY TOO LONG.
8105           TY MUSIC
8106          SV R=0
8150        /CODE/
8151          IF RPTIME>10, TY OK, BUT TOO LONG.
8152          SV R=R+1
8153          IF R>=6, GO TO FRAME 15 + 105
8200        ""
8201          IF RPTIME>10, TY TOO LONG.
8202           TY CODE
8203          SV R=0
8250        /CLEAN/
8251          IF RPTIME>10, TY OK, BUT TOO LONG.
8252          SV R=R+1
8253          IF R>=6, GO TO FRAME 15 + 105
8300        ""
8301          IF RPTIME>10, TY TOO LONG.
8302           TY CLEAN
8303          SV R=0
8350        /SCIENCE/
8351          IF RPTIME>10, TY OK, BUT TOO LONG.
8352          SV R=R+1
8353          IF R>=6, GO TO FRAME 15 + 105
```

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```
8400          ""
8401            IF RPTIME>10, TY TOO LONG.
8402             TY SCIENCE
8403            SV R=0
8450          /KEY/
8451            IF RPTIME>10, TY OK, BUT TOO LONG.
8452            SV R=R+1
8453            IF R>=6, GO TO FRAME 15 + 105
8454            GO TO FRAME 10 + 10
8500          ""
8501            IF RPTIME>10, TY TOO LONG.
8502            TY READ ABOUT SERIAL LEARNING, AND PROCEED TO THE NEXT↴
8998                                                                  TASK.
8999
9000        FRAME   9
9001
9002        READ THE FINAL SECTION OF THE TEXT, AND TRY TO
9003        DEFINE LEARNING FROM WHAT YOU HAVE JUST SEEN.
9050          /CHANGE,PERFORMANCE,BEHAV,EXPER,RESPONSE/3
9051             TY YES.  ONE GENERAL DEFINITION OF LEARNING IS
9052             TY A CHANGE IN BEHAVIOR OR PERFORMANCE DUE TO
9053             TY EXPERIENCE
9054             GO TO END      GOOD-BYE
9100          /ACQUISIT,APPLICAT,KNOW,SKILL,RELATION/3
9101             TY ONE GENERAL DEFINITION OF LEARNING IS THAT
9102             TY IT IS THE ACQUISITION AND APPLICATION OF
9103             KNOWLEDGE OR SKILL.
9104             GO TO END   GOOD-BYE
9150          /KNOWLEDGE,FACT,ANSWER,SOLUT/
9151             TY YOU ARE USING SOME TRADITIONAL TERMS.
9152             TY WHAT TELLS A PSYCHOLOGIST THAT A STUDENT
9153             TY HAS LEARNED FACTS OR SKILLS?
9154             GO BACK
9200          /IMPROVE,BETTER/
9201             TY WHAT IMPROVES WHEN SOMEONE LEARNS A
9202             TY BAD HABIT?  TRY AGAIN.
```

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```
 9203          GO BACK
 9250        /PERFORM,BEHAV,RESPONSE/
 9251          TY PERFORMANCE (BEHAVIOR OR RESPONSE) IS AN
 9252          TY IMPORTANT ELEMENT.  TRY AGAIN.
 9253          GO BACK
 9300        /CHANGE,NEW,DIFFER/
 9301          TY CHANGE IS AN IMPORTANT DIMENSION.
 9302          TRY AGAIN FOR A BETTER DEFINITION.
 9303          GO BACK
 9350        /EXPERIENCE, STIMUL, SITUAT/
 9351          TY EXPERIENCE IS AN IMPORTANT ELEMENT.  LEARNING
 9352          TY SHOULD BE DIFFERENTIATED FROM THE EFFECTS OF
 9353          TY DRUGS, FATIGUE, OR MATURATION.
 9354          GO BACK
 9998
 9999
10000      FRAME  10
10001
10002        GO1 BACK MENTION WHAT A PSYCHOLOGIST OBSERVES AND MEASURE
10003         TY2 CONSIDER HOW A PSYCHOLOGIST DECIDES IF LEARNING HAS
10004         TY2 PLACE IN A GIVEN SITUATION.                       TAKEN
10005          GO2 BACK
10006        TY3 BEHAVIOR CAN BE CHANGED BY MANY THINGS
10007        TY3  (FOR EXAMPLE, DRUGS OR FATIGUE) -- IS
10008        TY3 THIS LEARNING?  TRY AGAIN.
10009          GO3 BACK
10010          TY4 A GENERAL DEFINITION OF LEARNING IS A CHANGE
10011          TY4 IN BEHAVIOR OR PERFORMANCE DUE TO EXPERIENCE.
10012          GO TO END  GOOD-BYE
END OF FILE
```

TROUBLE SHOOTING

```
$RUN FCIL# 6=*MSOURCE* 7=*MSINK* 8=TROUBLE2 9=-X
$SOURCE *MSOURCE*
BRANCH=0
BULB=1
FUSE=2
PLUG=3
SWITCH=4
RADAR=5
:START OCHONY=0
DUPLIC=0
TY ENTER THE CCMPONENT FAILURE PROBABILITIES (AS PERCENTAGES,
   TO THE NEAREST WHOLE PERCENT) IN THE FOLLOWING ORDER:

       BULB, FUSE, PLUG, SWITCH, RADAR
ACCEPT
  IF '.', GO BACK GIVE PROBABILITIES TO THE NEAREST WHOLE PERCENT
     DO NOT USE DECIMALS.  GIVE YOUR PROBABILITIES OVER AGAIN.
  P(1)=NUMBER.(1)
  P(2)=NUMBER.(2)
  P(3)=NUMBER.(3)
  P(4)=NUMBER.(4)
  P(5)=NUMBER.(5)
  CUMP(1)=P(1)
  CUMP(2)=P(1)+P(2)
  CUMP(3)=P(1)+P(2)+P(3)
  CUMP(4)=P(1)+P(2)+P(3)+P(4)
TY THE PROBABILITIES LISTED BELOW ARE THE ONES YOU HAVE TYPED IN.
   (-9999 INDICATES THAT YOU FAILED TO ENTER A PROBABILITY

TY BULB PROB.
TY #P(1)
TY FUSE PROB.
TY #P(2)
TY PLUG PROB.
TY #P(3)
TY SWITCH PROB.
TY #P(4)
TY RADAR PROB.
TY #P(5)
TY IF YOU WISH TO CHANGE THESE PROBABILITIES TYPE "CHANGE";
   OTHERWISE TYPE "GO ON".
ACCEPT
  IF ' CHANGE ', GO TO START
:TIRETN TY ENTER THE TIME REQUIRED TO CHECK EACH COMPONENT (TO THE
   NEAREST WHOLE SECOND) IN THE FCLLOWING ORDER:

   BULB, FUSE, PLUG, SWITCH, BUTTON
ACCEPT
  IF '.', GO BACK GIVE CHECKING TIMES TO THE NEAREST WHOLE SECOND.
  TIMEX(1)=NUMBER.(1)
  TIMEX(2)=NUMBER.(2)
  TIMEX(3)=NUMBER.(3)
  TIMEX(4)=NUMBER.(4)
  TIMEX(5)=NUMBER.(5)
```

```
TY THE TIMES LISTED BELOW ARE THE ONES YOU HAVE TYPED IN.

TY BULB TIME
TY #TIMEX(1)
TY FUSE TIME
TY #TIMEX(2)
TY PLUG TIME
TY #TIMEX(3)
TY SWITCH TIME
TY #TIMEX(4)
TY BUTTON TIME
TY #TIMEX(5)
TY IF YOU WISH TO CHANGE THESE TIMES TYPE "CHANGE"; OR TYPE "GO ON".
ACCEPT
   IF ' CHANGE ', GO TO TIRETN
R(1)=1000*TIMEX(1)/P(1)
R(2)=1000*TIMEX(2)/P(2)
R(3)=1000*TIMEX(3)/P(3)
R(4)=1000*TIMEX(4)/P(4)
R(5)=1000*TIMEX(5)/P(5)
RPRIME(1)=R(1)
RPRIME(2)=R(2)
RPRIME(3)=R(3)
RPRIME(4)=R(4)
RPRIME(5)=R(5)
J=1
K=5
:AONE I=1
TEMP=R(1)
TEMP1=1
:AFIVE I=I+1
IF TEMP=R(I), DUPLIC=1
IF TEMP > R(I)
  TEMP=R(I)
  TEMP1=I
IF I < K, GO TO AFIVE
MINVAL(J)=TEMP
R(TEMP1)=R(K)
J=J+1
K=K-1
IF K > 1, GO TO AONE
MINVAL(5)=R(1)
J=1
:ATHREE I=0
:ATWO I=I+1
IF MINVAL(J)=RPRIME(I)
  K=0
  :AFOUR K=K+1
  IF I=OPSEQ(K), GO TO ATWO
  IF K < J-1, GO TO AFOUR
  OPSEQ(J)=I
  J=J+1
```

APPENDIX D. TYPICAL INTERACTIONS BETWEEN STUDENTS AND THE COMPUTER PROGRAMS

A QUIZ

A SIMULATED LABORATORY

A LEARNING MODEL

A SECTION OF A QUIZ FOR INTRODUCTORY PSYCHOLOGY

(Computer response in capitals & student response indented in lower case.)

Conversation	Commentary
...ENTER A BRIEF DEFINITION OF PSYCHOLOGY	
study of the mind	Had "study" or "science" not been present, the system would have replied: "The significance of 'ology' seems to be missing from your answer."
THINGS MENTALISTIC CANNOT BE OBSERVED DIRECTLY. TRY AGAIN INCLUDING MENTION OF WHAT YOU BELIEVE TO BE OBSERVED.	The word "mind" triggered off this reply.
study of individual people	The computer found "people" but not "animals."
(Projector displays slide summarizing interesting animal experiments which have apparent relevance for humans.)	Student reads slide faster than computer could have typed out the information.
THE SLIDE SUGGESTS THAT PSYCHOLOGISTS STUDY ANIMALS AS WELL AS MEN. GIVE A BROADER DEFINITION.	
study of people and animals	Having recognized two thirds of the answer the author prompts the student for the remainder.
SPECIFICALLY WHAT IS IT ABOUT MEN AND ANIMALS THAT PSYCHOLOGISTS STUDY?	
their thoughts and feelings	
EMOTIONS, FEELINGS AND CONSCIOUSNESS ARE OF CONCERN TO PSYCHOLOGISTS, BUT THEY AREN'T STUDIED DIRECTLY. REDEFINE PSYCHOLOGY IN TERMS OF WHAT IS OBSERVED.	"Thought," "think," "feel," "aware" and a number of other words bring this reply.
study of actions or expressions of men or animals	This definition satisfies the author's criterion by including one from each list:
YOUR ANSWER NOW SEEMS TO AGREE WITH OURS. SINCE IT TOOK YOU 5 TRIES, HOWEVER, COMPARE IT CAREFULLY WITH THOSE ON THE SLIDE.	
(Projector shows a slide giving sample definition from three popular textbooks.)	
(The quiz continues with examples of psychologicals studies and scientific method in the social sciences.)	

science	organisms		behavior
study	animals		action
	man		response
	men		
	people	and	
	human	animals	

EXCERPT FROM A SIMULATED LABORATORY VISIT

EXPLANATION OF THE SECOND LEARNING TASK

This time you were asked to associate pairs, and this task is called "paired-associate learning" by psychologists. Examples are common in college instruction: second language vocabulary, chemical symbols, physical constants, etc. Psychologists usually prefer to do some basic work giving meaningless syllables to avoid the effects of associations established earlier which are not constant from one person to another. Nonsense, one-by-one presentation, and random order are used to make the task more difficult. When subjects succeed on the first trial the experimenter does not obtain data on how learning takes place (errors, omissions, etc.).

INSTRUCTIONS FOR TASK THREE

The machine is programmed with a simple concept or rule having to do with the number and arrangement of twelve items. For convenience we shall use the letters z, x, and c. Your job is to discover the rule by entering various arrangements of twelve letters (no spaces) for the machine to judge. It will answer yes or no, and give hints. For example, you might test whether the rule requires 4x's, 4z's and 4c's by entering "xxxxzzzz cccc" as your first experiment. Begin with the simplest and progress to testing more complex hypotheses if the simple ones are not verified.

When you think you can state the rule enter "r" instead of another test case. Remove the shield so you will be able to look back through earlier successful or unsuccessful attempts, and hints. Only by careful "experimentation" will you uncover the rule which covers all possible "yes" cases and excludes all "no's."

Make a few tests (of twelve letters in different combinations and arrangements) and then enter "r" instead so you can try formulating a rule which says something about the proper number of each letter and the arrangement or pattern. You should look for the simplest statement of the rule which covers all the "yes" instances and excludes all the "no's."

CONVERSATION	COMMENTARY
Begin whenever you have finished reading the instructions on the slide.	
ZZZZXXXXCCCC	
Too many Z's. Try again.	Hints about the numbers of letters encourage the subject in this simulated experiment to be systematic.
ZZZXXXXCCCCC	
Too many Z's. Try again.	
ZZXXXXCCCCCC	
Yes. Enter 'R' or try another test.	With only one positive instance he has an hypothesis. A first guess is not likely to be correct.
R	
Type in the key words or symbols of your rule in one line.	
2 Z's, 4 X's, 6 C's IN THE ORDER ON THE KEYBOARD	
You have the right numbers but the arrangement is not correct. Test hypothesis about the order of the letters and whether they can be divided.	He is sent back to look at the other dimension.
ZZXXCCXXCCCC	
Yes. Enter 'R' or try another test.	
ZXXCCCXXCCCZ	
Numbers ok; arrangement incorrect.	Now he is making progress.
CCXXCCXXCCZZ	
Yes. Enter 'R' or try another test.	
ZXCZXCZXCZXC	Another negative instance may be useful here.
Numbers ok; arrangement incorrect.	
R	
Type rule.	
2 Z, 4 X, 6 C, IN GROUPS OF TWO	This student discovered the rule quickly, probably because he worked on simple hypothesis as suggested.
Very good. That seems to agree with my rule.	

An excerpt from experimentation with a learning model

Adjust the reinforcement schedule by an increasing ration: 2:1, 3:1, 4:1, 6:1, 8:1, and so on. Don't push too fast, and come back to a lower schedule as necessary. Indicate higher number of ratio desired for each minute.

The student already has some experience shaping the rate of response of a simulated organism.

MINUTES	RATION	RESPONSES	
1	2	5	
2	3	12	
3	3	6	
4	3	12	
5	3	10	
6	2	6	Student drops back to 2:1 schedule to keep animal responding.
7	3	12	
8	3	12	
9	4	6	
10	4	12	This time the student sticks with the higher ratio.
11	4	10	
12	3	12	
13	3	11	But he is not sure the organism will maintain it.
14	4	7	
15	4	5	
16	4	11	
17	4	11	
18	6	7	Finally he goes on anyway.
19	6	5	
20	4	7	He can't sustain the level of responding. He will be invited to explore the parameters set for this hypothetical organism.

APPENDIX E. THE INDEPENDENT STUDY MATERIALS FOR PSYCHOLOGY

Memo to Prospective Students (with List of Hints)

Student Information Sheet

Student Roster Format

Course Description

Sample Units from the Study Guide

Student Record of Activities

Student Opinion Forms

Center for Research on Learning and Teaching
and the Department of Psychology
The University of Michigan

TO Students considering self-instruction program for introductory psychology

FROM Karl L. Zinn, Advisor

You may have preregistered for this section without knowledge of its special nature. Please read enough of the enclosed materials today to make a decision right away about staying or transferring.

If you wish to shift to another section call me or your advisor right away to arrange a transfer to a more suitable section and not miss the first class meeting.

If you do volunteer for this special section, read the course description, procedures and skim the dittoed materials for the first three units. Try to take the first computer quiz before the first meeting of the entire group, and plan to finish Unit 1 by the end of the first week.

Along with other responsibilitees for your own instruction you should be familiar with all the written instructions passed out (course description, study guide, memos, etc.) and keep them available for reference. I suggest you keep everything in the ring binder provided; copies of all papers (being property of the experimental project and needed for revision of materials) must be returned with the ring binder when you finish (or drop) the course. You can help improve the self-instruction program by writing in critical and constructive comments on all of the duplicated materials.

When you have a question about purposes, materials or procedures, first check the information you have in writing, then ask a classmate. I am working toward a completely self-instructional course (including student interaction and contact with faculty, on student initiative). If you don't find the information or materials you need, come to me before you waste any study time. Please phrase your question in terms of what is missing from the duplicated materials; I will need that orientation in order to change and improve the materials.

If you need any assistance on finding materials or taking computer quizzes I suggest you will get better assistance from my research assistant than from me. You will find the student teaching assistants helpful also, (see name list).

A list of hints for students considering the self-instruction program for an introduction to Psychology. This list was assembled from comments of students who have already tried the program. Current students are encouraged to add their own comments and suggestions to clarify the goals and procedures for future students electing the self-instruction option.

Don't select this section unless you:

a) have a strong desire to learn (since little motivation is provided by grades or class schedule),
b) find the material interesting,
c) are independent (have a large amount of self discipline), and
d) are well organized and serious.

The self-instruction program:

a) provides many options,
b) makes few specific demands,
c) is interrupted by deadlines from other courses, and
d) is not the place for a procrastinator to try mending his ways.

Suggestions for those who select the program:

1. Keep the records requested in study program up to date. Don't wait to finish a reading before noting your thoughts on it. Don't wait till the end of a week to fill out a record of time spent.

2. Note all references you use, even if only briefly, so you will be able to find them again. You will be surprised how much of your earlier browsing will relate to later studies. Be able to find any item again.

3. Talk with your fellow students. They are a good source of opinion on which readings are worthwhile or useful for certain interests or purposes. Discussion may be the most valuable part of the course as far as using knowledge.

4. Don't let yourself fall too far behind just because this class is mostly independent study. Remember most of your other teachers will be demanding more work toward the end of the semester. Set up a steady pace for yourself. Discipline yourself and take your responsibility to cover the material seriously.

5. Take advantage of opportunity to study from films and tapes. They are a pleasant and easy way to absorb material. Try to schedule with others in the class to watch and listen together so you can have a discussion following. Written reactions on materials in these media will increase their contribution to your study of psychology.

6. Prepare yourself for challenging questions on problem sets and exams. Don't be afraid to use your imagination on many of these. Here is your opportunity to synthesize and remold what you have gleaned from your readings into enlightened solutions to some real challenges which have or do face psychologists.

7. Bear in mind general ideas of scientific method as you read and study. Try to discover the main ideas of each writer and compare differences in assumption, definitions and theories. These comparisons will be particularly helpful in understanding different approaches to significant topics.

Student Information Sheet

Name:

Local address:

Local phone:

School: LSA
Education

Class: Fr.
Soph.
Jr.
Sr.

Expected concentration
or major interest: ____________________

Courses in psychology or related fields such as sociology or education:

Previous to this semester:

Concurrent with this course:
(give section number or instructor's name)

Books or articles you have read which relate to psychology, such as Hidden Persuaders, a book about Freud, or an article on retarded children (describe it as best you can if you can't recall the title or author):

Special interests and activities related to psychology, such as advertising, propaganda, civil rights, teaching, research on animal behavior, or volunteer hospital work:

Why did you enroll in Psychology?

STUDENT ROSTER FORMAT

NAME LIST: Self-instruction Program for Introductory Psychology

Copy of fall term students for use by winter term students. They can advise on whether to take the special section, and how to gain the most benefit from it. Some of them will still be finishing up the course requirements. Don't hesitate to call one of the persons on the list, and just try another if the first one isn't interested in talking about the course or the materials.

Although you may be hesitant to call on other students from this semester's SIP class or the class from last semester there are three teaching assistants who have volunteered to work as tutors, at least for small amounts of time. Do not hesitate to call on them. Of course you will also find good sources of information, conversation, and debate in or near your own living quarters. Nearly all of the students at the University take Introductory Psychology at some time during their four years here.

Name, local address and phone	Interests and previous related readings in psychology
	A sample of student interests included: music, mathematics, physics, philosophy, psychology, nursing, history, linguistics, elementary education, anthropology-zoology, medicine, and English. Related readings included: Freud, Packard, "Lisa and David," Allport, Rogers, Jung, *Waldon II*, Skinner, Fromm, Lindner, advertising, propaganda, civil rights, *Scientific American*, *Summerhill*, and ESP.

INTRODUCTION TO PSYCHOLOGY

SELF-INSTRUCTION PROGRAM (SIP) COURSE DESCRIPTION

Karl L. Zinn, Advisor
1315 Hill Street, room 205
Tel. 763-0158

I. PURPOSES AND OBJECTIVES OF INSTRUCTION

A. GENERAL EDUCATIONAL PURPOSES.

This program is designed to encourage each student to work on his own schedule and by his own initiative, both individually and with other students. The intended result is a layman scholar, curious about behavioral phenomena and regularities, interested in learning, able and likely to seek out information relevant to interesting questions, reasoning from broad principles of scientific method, and free of dependence on particular and transitory facts or procedures.

The self-instruction approach is based on four premises:

> Motivation is an important determinant of what a student learns and the efficiency with which he learns it. Self-selection of instructional material, interaction with peers, and display of achievement via papers, debate and other activities are important components of relevant motivation.
>
> Usefulness of knowledge in a different time and place is greater when the learning conditions are similar to the situation in which the knowledge is to be used.
>
> Knowledge in the behavioral sciences is changing rapidly, and certain specific facts and procedures, if accurately retained, may become useless or even misleading in the near future.
>
> Feedback or knowledge of results is important to learning. Relevant feedback can be provided efficiently by programmed instruction, study guides, self-administered tests, peer interaction, and instructor tutorial.

B. GENERAL OBJECTIVES

1. Knowledge of Content in Psychology.

terms
facts
concepts
conventions
procedures
methodology
principles
theories
models

These are important for the discussions of this course (immediate knowledge), and as preparation for later courses or your own reading in psychology and related fields (longer retention). A core of content will be designated as essential for all students. You will go beyond this in areas of interest to you.

2. Understanding of Topics or issues in Psychology.

a. Translation. Given a statement in psychological terminology, you should be able to translate it into common language, and vice versa.

b. Interpretation. You should be able to identify and comprehend the major ideas of an article or lecture on psychology, including graphic data.

c. Extrapolation. Sometimes you will be expected to go beyond the information given and make some inference about things not included in the data.

d. Application. You should be able to use the terminology, concepts, etc., in identifying the characteristics of a situation new to you, and use psychological principles in handling problems in the social sciences.

3. Analysis and Evaluation.

a. You will be asked to pick out essential assumptions and definitions, and to detect logical fallacies in reasoning.

b. You should be able to summarize the adequacy of an argument including its assumptions, facts, and logic.

c. Given some criteria for the purpose, you should be able to compare conflicting generalizations or theories.

4. Synthesis.

The first three objectives emphasize recognition, analysis and comparison. This one provides for the construction of material.

a. Formulation of hypotheses, definitions, and a plan to test some hypothesis.

b. Communication of your ideas on some issue.

c. Initiation of independent thought such as a novel application of a psychological principle. This is not a requirement of this course, but it is part of the "independent study" concept.

5. Attitudes and Interests.

a. We hope to see evidence of a continuing interest (taking additional courses and reading independently in psychology and related fields).

b. If our methods are successful you will feel that your study of psychology (via films, readings, and discussion) has been worthwhile.

c. We also hope to influence your attitude toward minority groups, mental illness, the deviant individual, scientific testing of hypotheses, etc., at least in the direction of greater awareness and open-mindedness.

Of course we won't try to measure your achievement of these attitudinal objectives, and they in no way influence your grade. Your behavior in this area would be important in a complete evaluation of the effectiveness of independent study, but the data collected in connection with this one section would not be sufficient to test this.

6. Individual Objectives Not Included Above.

   a. The course may be required for your program of study. Usually the reasons for this are related to objectives 1 through 4 given above. Ask your advisor why an introduction to psychology is required for you. Discuss with me the goals that are relevant to your program. All students will be encouraged to select readings related to their own field of interest.

   b. The course may be a prerequisite for other courses. This course will survey and otherwise prepare you for advanced courses. Achievement of objectives 1 through 4 constitutes excellent preparation. In addition you can choose to do advanced reading to explore other psychology courses which interest you.

   c. You may be seeking information about psychology in general. Participating in the activities of the course should cause you to do considerable thinking about psychology, especially its methodology, substantive issues, and relation to social problems.

   d. You may want information about additional psychology courses. See a tutor if you would like counseling on this matter.

   e. Some students take psychology so they will better understand their roommates. The course may help, but this is quite incidental at the introductory level. However, trying to apply the material to real people will help you understand introductory psychology.

   f. You may have landed here only because of the scheduling convenience of this special section, or because you don't expect to work as hard. If you find no better reason by the end of the first few weeks, you should change sections or drop the course. It will become more and more tedious or frustrating as you are pushed into considering and debating each new issue.

C. SPECIFIC OBJECTIVES: THE STATEMENT OF COURSE CONTENT

The actual content considered by each individual student is expected to vary considerably due to differences in interests, backgrounds and purposes. However, you will find throughout the study guide a list of terms and issues typically covered in an introduction to psychology. Those that are expected to be especially useful in readings and group discussions are marked with an asterisk (*). By the end of the semester you should be able to recognize these in any meaningful context. The remainder of the list should be helpful to you also.

A second and more complete listing of the content of an introduction to psychology is available in the reference file in the study room. It is a compilation of material to be considered for the introductory course, and was prepared by instructors at The University of Michigan for anyone teaching introductory psychology. Although many of the references may be difficult reading for a student you will find the additional content of this list interesting to consider, especially after you have achieved some orientation to the field.

Perhaps the most influential statement of objectives for you is the quiz and test items and other assessment situations you will encounter during the course. Samples are included in the reference file. Some of the general objectives cannot readily be represented on examinations and certainly only a small sample of the content can be included. However, the sample used for assessment each term is carefully selected to be representative; it should encourage you to work on all objectives throughout all areas of content.

II. MATERIALS AND METHODS OF THE COURSE

A. STUDY GUIDE.

This is intended to guide you in selection of learning experiences. In this program a certain minimum is required: during your term of study you should read the entire guide and carry out the assignments which are indicated by an asterisk (*). This marked group of films, tapes and readings makes up a minimal introduction to psychology as a social science. Beyond this you select the remainder of your study considering your interests, background and special objectives in taking the course. A tutor can provide further guidance if you need additional help. Certainly do not limit yourself to the references in the study guide.

On your copy of the study guide you should mark your opinion of each item as soon as you finish it. Write in any items which are not already included. A space is provided to check off your opinion of "worth, difficulty and interest" and to write in any special comments. At the next convenient time, copy your opinion into the reference file on student opinion of course material. Record your judgment by placing your initials in the next higher box of the appropriate column, as in the sample in the front of the file.

Credit for a unit will not be approved until your initials appear in the summary of student opinion. This system will make it easier for students or supervisors to assess the value of different items of material. Furthermore, future students will be able to select readings more confidently by consulting the compiled opinion.

B. READINGS.

The various readings of the course can serve all of the objectives. But the first objective, knowledge of content, is served best by reading. Therefore, I leave the achievement of this objective to your own reading, with some prompting via study questions, discussions and quizzes.

The first page of the Study Guide includes a number of general textbooks and collections of readings. Some guide for the selection of additional readings is provided by textbook chapters, tutorial discussion and your classmates. Do not overlook this last possibility. A list of readings done by each student will be posted in the study room to help you find out what others are doing.

I hope to maintain a set of important and interesting books on the shelves of the study room, but you will want to use the stacks of the University Libraries as well. Some readings and texts you find will have been published several years ago. Some will still be useful, while others have become outdated. Further research and thought may have added to the information or altered the interpretations. Evaluate each reading for its current applicability. Qualifications of the author are relevant, and you may want to check reviews in the reference file or the journal of reviews: Contemporary Psychology.

Along the same line, you may be tempted to use condensations and outlines (eg. the College Outline Series). While some of these outlines are keyed to textbooks you will be using, unfortunately it may be an old edition of a current textbook. You may also find that some of these materials do not give you the type of information you should have in this course; that is, we are interested in understanding concepts and we value the ability to use what you have learned to go beyond assorted facts acquired by rote.

The reference file in the study room contains articles from newspapers, magazines and professional journals along with comments on readings and films. This is one place to browse for suggested readings, and to leave your suggestions for others.

C. LIST OF TERMS AND ISSUES; QUIZZES AND PROBLEM SETS.

These lists and files define the recommended content of the course, and the starred items indicate the required core. The list of terms and issues should provide direction for your study of a survey of psychology, and the quizzes and problem sets can be used to assure yourself that you have been successful.

In order to provide immediate feedback on quiz performance and where appropriate to recommend further reading, the quizzes are presented by computer (using an electric typewriter connected by phone line). Hints and answers are returned as you respond to each question, and your score and diagnostic suggestions are printed out at the end.

Each quiz requires from 30 to 60 minutes. They are available on the Michigan Terminal System any hour it is available. You may use any terminal, but you may prefer the IBM 2741 because of the familiar keyboard and full character set.

When you finish a quiz, turn in to a tutor the print out of your interaction with the computer system. He will correct mistakes the computer made in scoring your responses, answer any questions you asked, and perhaps make other comments and suggestions before returning the copy to you for further study.

Problem sets are included in the study guide. Answer the discussion questions and turn them in for checking and comment. You can answer in whatever format is convenient for you and legible for me to read, but typing is preferred. It is quite appropriate to type your answer double-spaced on another sheet of paper just giving the label of the problem set and the number of the question; don't bother to retype the questions.

D. REACTION RECORD AND/OR INFORMAL PAPERS.

In order to encourage thoughtful consideration of the material and to assure preparation for the discussion meetings, written reactions to significant items of material are recommended. What is significant depends on your own background and interests; remember that the materials include discussions and special activities as well as readings, lectures and films.

You may want to react to each item as it occurs so you will be prepared for class discussion and so your record will be up-to-date at all times. Or you may prefer to write a brief and informal paper after studying a unit or special topic. In either case something should be turned in every few weeks as evidence of thoughtful study.

If you do individual reactions consider them informal commentary on or critique of the materials; less than one double-spaced page usually is sufficient. You might:

1. give the two or three main points or just the major point of view,

2. compare and contrast the selection with other material or your own experience (sometimes you will wish to write a few pages),

3. give your own opinion or ask questions, and

4. evaluate the arguments and the evidence whenever it seems appropriate to do so.

Use a binder or folder about 8 1/2 x 11 in size. A spiral notebook is acceptable, but less convenient. Clearly identify each reaction by author, title, chapter or whatever is relevant. Be sure your reactions clearly stand out from any other notes you wish to include in this notebook. Put a mark in the margin or label on the top right corner of the pages which include reactions. I will ignore your notes unless you direct me to them by some comment in your reaction.

Arrange your reactions in whatever order facilitates your learning. I would recommend arrangement by topics, e.g., all comments on perception together. A loose-leaf binder permits easy reorganization and ordering of your notes. Please make your writing legible. If I have difficulty reading it I will have to ask you to type each reaction.

If you prefer to do informal papers, the format is more flexible but purposes are the same. Combine material in your discussions and comments in any way useful for your study. By "informal" I mean no footnoting is necessary (although reference to author and title are useful) and a double-space format with changes written in the margins and between the lines is satisfactory. No final typing is needed if it is already legible.

While reading your records or papers I will write comments, answer your questions, suggest other readings, and occasionally ask you questions. All records or papers are to be turned in before the last class meeting. I will read over the entire semester's work (including your responses to questions and comments) before the final exam is written. Turn them in a few weeks early if you want them back for study before the final exam.

Since this is a four-credit course, I expect you to spend about 12 hours per week reading, thinking about, or discussing psychological topics (these activities include class meetings, I hope). Your record should be good evidence of your effort. Keep in mind that in evaluating records, I will look for evidence of thinking, not excellence of thought.

Provision for reaction records and informal papers is an effort to individualize instruction. I encourage everyone to make use of this opportunity and to consult with me individually about his special interests or questions or problems related to his study of psychology this semester. Sometimes I won't be of any help. Other times, through a change in suggested readings, study habits, or attitudes,-- or just through deeper discussion of some issue, you will find the material of psychology more interesting, more useful or more challenging. Achievement in this course is directly related to involvement in the subject matter and its applications.

E. LECTURES AND FILMS.

A number of films will be available on a cartridge-load film projector in the study room at your convenience; others will have to be scheduled for a group showing. Occasionally I will announce special showings or special lectures, perhaps in combination with other groups. The schedule will be posted on the bulletin board in the study room.

The tapes are kept on a shelf in the study room for use with a tape recorder there. Some tapes and films are marked on the study guide in addition to books and written exercises. All starred materials are included in the core of material of this course. In other words, the materials recommended for achievement of the first two objectives (knowledge and understanding of content in all areas of psychology) are starred.

Outlines have been prepared to document the lectures and make them easier to use in self-study. The listener is freed from detailed note-taking, and yet has some to maintain visual attention and to serve as a quick review. Additional notes can be taken from the outlines after the lecture, and questions organized for later discussion.

Definitions and diagrams are included where needed, and key phrases are used as "landmarks." It may be helpful to glance over the outline before listening. Of course it is possible to stop the machine and back up to listen to a difficult section again.

Previous students have had some difficulty listening to taped lectures. Since this is the first trial with new outlines of the taped lectures, additional comments are needed from students who use them. Does the outline confuse or clarify, motivate or distract? Which outline is a particularly good example of a study aid? Which is poor? Do the incomplete statements involve the listener in a way that is helpful to understanding and learning? Does the listener need to refer to an outline constantly or can he get along by glancing at it when he is confused? Does an outline help in note taking or reviewing. Do the associated slides for some lectures help to maintain attention? What other techniques or study aids might help students learn from tapes in order to tap this important resource of professional psychologists you wouldn't hear otherwise.

Scheduled presentations can be as effective as individual ones if you become involved in discussion with others afterwards. You should have the opportunity to select each lecture or filmed presentation when it best fits your study. However, group presentations can be made more valuable if you become actively involved in them individually; you should consider, compare, question and debate among yourselves and with a tutor.

These materials are intended to increase interest, and also to provide examples, points of view, etc., which serve the interpretation and Analysis objectives.

F. DISCUSSION (STUDENT INTERACTION).

A program of independent study should not lose sight of the value of small group discussion to facilitate verbal exchange among students. This should serve all the objectives of the course, but especially Understanding and Analysis. To manage this you should:

1. Compare your reactions to the readings and formal presentations with those of other students.

2. Organize and argue your position before your peers.

3. Critically evaluate the arguments of other students, and

4. Discuss papers, projects, quizzes and tests among yourselves.

Meetings outside of class are encouraged. In the past, students have met in the study room, the Union, and a dorm lounge. Invite a tutor if you wish.

G. TUTORIAL (STUDENT-TEACHER INTERACTION).

A minimum of 30 minutes will be scheduled for each student each week. Indirectly, tutorial should help you achieve all objectives, but in particular the interaction should serve Analysis and Synthesis. I suggest you:

1. Ask a tutor for suggested readings in areas of special interest to you,

2. Carry on extended dialogues via written reactions and informal papers, and

3. Write longer papers or perhaps carry out modest experiments.

H. RECORD OF STUDY

Included with the materials set and in the reference file are forms on which you are to record study time each day. Include all activities: films, lectures, reading, searching for books, class discussion and even bull sessions related to your study of psychology. This record is necessary to the instructor for re-design of the course materials and procedures, and useful to the student reviewing his own study habits and progress in the course.

Each week copy a record of your work into the "summary of study" posted for you on the study room bulletin board. This shows other students what you are reading, and encourages more conversation among students studying in similar areas.

III. EVALUATION OF YOUR ACHIEVEMENT IN THE COURSE

A. QUIZZES AND PROBLEM SETS.

Each section of the study guide includes a quiz testing knowledge and understanding of terms and concepts listed in the statement of course content. A problem set for each section provides exercises in application, analysis and evaluation. Extra copies are available in the reference file. They may be completed at your convenience and modified on the basis of discussion with other students or a tutor. Turn these in as they are completed in order to obtain comment.

Quizzes and problem sets are for self-evaluation and diagnosis. They are not graded the first time you turn them in. They will be returned to you for reference, and any corrections or additions needed will be marked. You will be encouraged to rewrite any item which is lacking until you have met the standards for that section (i.e., has been graded "A" for exercises on that section).

Some students have questioned the value of short-answer and computer-graded quizzes. How does a teacher ever know the difference between "understanding" and just writing in the key words? I suggest it is by cleverness in phrasing questions that require the student to interpret, translate and apply information and skills to new situations. Actually it is sufficient if the quizzes determine whether you use the terms correctly (with or without understanding). Other learning exercises and discussion will be used for assessment of understanding.

The quizzes (and the "knowledge" objective) are a necessary but not sufficient condition, that is, necessary to effective discussion and further learning but not sufficent to demonstrate understanding of the concepts.

B. HOUR TESTS AND FINAL.

Objectives 1 through 4 will be represented in hour tests announced in advance. Content will be based primarily on the assigned topics. Understanding, Analysis, and Synthesis objectives can best be achieved by being an attentive and active learner in all learning situations, especially in discussion (both in and out of the study room).

Hour tests and the final will include both essay and objective type items. You will find samples of the format in the "Tests" folder in the reference file. Actual content will cover the core of material (marked in list of terms and issues) plus those areas selected by the student being tested.

C. TUTORIAL, DISCUSSION AND PAPERS OR OTHER PROJECTS.

Because of the flexibility of course procedure, and the individuality allowed in readings and projects, much of your achievement cannot be measured by formal tests. Therefore the tutors will consider reactions summaries, informal papers and the like in order to credit your individual efforts. These will be read and discussed as part of the tutorial method; keep all your papers and notes (perhaps in a looseleaf binder or folder) because periodically you will turn them in for an overall evaluation.

D. GRADING.

In general, the emphasis will be on learning, not grading. I will do all I can to discourage your doing things for the grade. However, I recognize how strong a motivator grades are, so I will also try to assure that the most worthwhile learning activities on your part are rewarded by weighting them in your final grade.

Some students have complained that quizzes and memorization of terms should not be part of the grade at all. There is a vocabulary necessary for discussions in psychology and especially during this course. I want to be sure that you have this vocabulary ready to use. Therefore you have lists of terms and detailed quizzes. Knowledge of content contributes less than 25% to an overall grade. On the quizzes you are grading yourself for diagnosis of your mastery of the content; the hour tests are part of the assessment for grading purposes. A minimum set of terms starred in the list of terms and issues should be familiar to you and quite readily used in discussion and writing during and after the course. I don't believe that I give any more weight to terminology than regular instructors; but I do make my objectives in this area quite explicit.

I hope to so arrange the materials and self-tests that any student with considerable scholastic aptitude (you all have that), good study skills and self-discipline (you volunteered because of that), and twelve hours per week (4 credit hours times 3) will satisfy all major and minor objectives of the course and merit an A. The reference or standard is the general population of the introductory course in psychology. If you all score in the top 10 or 15 percent of that group on comprehensive exams and comparable writing activities, you will all receive A's.

Individual differences in study habits, skills and efficiency are so great that I can make no general statement about how long a student should spend on the self-instruction program. Twelve hours per week for 14 weeks (including meetings with me and other students in the class, searching for books, etc.) is sufficient to meet all of my objectives in the course and, if you are an able student, you will find you adequately complete all major and minor objectives (which I assess by an A). If you are not an able student, or have a hard time with the social sciences, or with the reading and reasoning of psychology in particular, then you will either work further to complete the course with an A rating of your work or be rated on how much was completed and how well it was done. I would not recommend working further unless you are really quite interested in psychology.

Those people who want to major in psychology probably should plan to do enough work to get an A, that is, I should have no hesitation in recommending a potential major for further study.

STUDY GUIDE

This listing describes the required material plus a number of suggestions. It is intended to help you begin finding readings which will be interesting to you. Do not be limited by it. Browse the shelves or reference file. Look through the paperbounds at a book store. Talk with your classmates and with a tutor.

Requirements and strong recommendations are starred on the reading list or mentioned in individual discussions.

GENERAL SOURCES FOR PSYCHOLOGY AS A SOCIAL SCIENCE

Textbooks for introduction to and survey of psychology.

These are the best source for the core of content (list of terms). From this reading you should be learning vocabulary, concepts and methodology of psychology - not memorizing but learning - by using the words. If a word occurs just once and never comes up again, you won't be expected to know it.

Most of the content of the examination will be taken from the list of terms and issues. In general the emphasis is on human behavior from the personal-social point of view. Physiological and some animal research is optional.

Originally the list of terms was drawn from Hilgard's textbook, the most encyclopedic , but that bias is reduced with each revision of the list. Any of a large number of texts are suitable. Choose whichever is interesting (and convenient) to you.

Some recommended texts are listed by senior author and call number in alphabetical order. Many not mentioned here are also suitable.

Selecting a text for your own use should be based on reading of annotations about each text book, discussion with students who have studied psychology, and convenience or availability. Try to select a text that is interesting and useful to you.
For example, some will find the encyclopedic approach of Hilgard a helpful reference to support careful study of psychology; others will prefer the discussion approach of McKeachie and Doyle. The annotation for Brown points out that it may be appropriate for some because of its social orientation. Take all of these things into account and make your choice. I don't have strong feelings so if a course text mentioned on the Study Guide happens to be available through a roommate or friend, use that one.

Calvin (Ed.) BF 139C (1961).Collection of review-like sections written for introductory students by outstanding psychologists, usually expressing a point of view. Scientific method; growth and development; experiencing the world (perception); learning, retention and motivation; personality and social behavior; professional aspects of psychology.

Brown HM 251. B91. Takes a social psychological point of view. A good text for a student preferring this approach.

Hilgard and Atkinson BF 121 H66 (4th ed.). Encyclopedic with glossary and references for advanced reading. Useful for later reference by psychology majors.

James BF 121J. Outstanding set of essays and discussions; especially relevant are chapters in vol. 11 on reasoning, instinct, emotions and will. Don't be concerned about the publication date except in regard to experimental evidence and current theories.

Kretch BF 121 K92 (1961). Text with social orientation.

McKeachie BF 121 M14 (1966). An interesting text striving to integrate theoretical thinking throughout all the topical presentations.

Morgan and King BF 131 M845 (3rd ed. 1966). A comprehensive text.

Munn BF 121 M97 (4th ed. 1961).

Ruch BF 131 R89 (6th ed. 1963). Emphasis on applied psychology for the individual layman.

Hebb, D.O. BF 131 H46 (1966). Emphasis on physiological psychology.

Collected Readings

Looking through one of these books is a handy way to cover a variety of readings. They are conveniently separated by major topics much as the course is divided. Five of these collections are listed in order of appropriateness for the typical student in the course.

Scientific American Reprints. On closed reserve; many originals on study room shelves.

New Directions in Psychology, Vol. 1 & II, BF 21 N53.

D. Dulany; Contributions to Modern Psychology, BF 131 D88 (2nd ed. 1963) paperbound.

Teevan; Readings for Introductory Psychology, BF 149 T26 (1965) paperbound.

Daniel; Contemporary Readings in General Psychology, BF 21 D18 (1965) paperbound.

King; Readings for an Introduction to Psychology, BF 21 K52 (2nd ed. 1966) paperbound.

R. Russell, Frontiers in Psychology, (1964) paperbound.

Bobbs-Merrill Reprints. On closed reserve; some on study room shelf.

Hartley and Hartley, Readings in Psychology, (1965) BF 121 H33.

STUDY GUIDE

I. SURVEY AND METHODOLOGY

Fill out the opinion and comment line for each item you use. Circle one number in each of three evaluation columns using these conventions:

D	I	W	C-your comment
1=easy for me	1=interested me	1=worthwhile	
5=difficult for me	5=boring to me	5=no value to me	

*A survey chapter from an introductory textbook (usually the first one in the book). Most survey chapters include comment on methodology, history and theory in psychology. Don't worry much about learning facts from this chapter; almost everything will come up again later in this course.

D 1 2 3 4 5　　I 1 2 3 4 5　　W 1 2 3 4 5　　C

Eysenck, H. J. Uses and Abuses of Psychology BF 121 E98. $.95 Penguin (a Pelican book). Consists of a number of short chapters which can be read independently. Easy reading and almost always found interesting. He gives examples of the potentials and limitations of psychology in predicting or controlling human behavior while he discusses IQ, vocational choice, attitudes, abnormality, and psychoanalysis.

D 1 2 3 4 5　　I 1 2 3 4 5　　W 1 2 3 4 5　　C

*Scriven or Hyman (following) or equivalent on methodology.

*Scriven, M. "Scientific Method: the foundation of psychology" in Calvin: Psychology ... BF 139 .C3. Scriven tries to get you thinking analytically about psychology: definitions, assumptions, experimentation, interpretation. This should be read slowly enough to think about what he is saying, and to answer his questions before he answers them for you.

D 1 2 3 4 5　　I 1 2 3 4 5　　W 1 2 3 4 5　　C

Hyman, R. The Nature of Psychological Inquiry Foundations of Mdn. Psych., $1.50 BF 38 H98. pp. 3-59 discuss methodology in the context of historic issues in psychology; useful for synthesis of ideas on methodology.

D 1 2 3 4 5　　I 1 2 3 4 5　　W 1 2 3 4 5　　C

STUDY GUIDE

Note: the ideas of a methodology chapter will apply to every article, lecture or issue you encounter during the term.

If you want to read more about the issue of validity of psychotherapy, see:

Feigl and Scriven: Minn. Studies in Phil. of Science BF 161 P28, vol. 1, articles by Skinner and Scriven

E. Hilgard et al: Psychoanalysis as Science BF 173 P98.

R. Sears: Survey of Objective Studies of Psychiatric Concepts, BF 173 S44

D 1 2 3 4 5 I 1 2 3 4 5 W 1 2 3 4 5 C

And, if you are interested in looking at methodology in studying human motivation:

Motivation and Emotion (Area II): Atkinson, J. Motives in Fantasy, Action, and Society. BF 683 A88.

D 1 2 3 4 5 I 1 2 3 4 5 W 1 2 3 4 5 C

Sanford, F. Advancing Psychological Science; Volume I: Philosophies, Methods and Approaches. Paperbound.

D 1 2 3 4 5 I 1 2 3 4 5 W 1 2 3 4 5 C

Taped Lecture, James McConnell: "You're in the wrong room, you're robots, and you're cowards!"

In some respects it can be unsettling. If you disagree with McConnell read Grunbaum's article in Daniel's Contemporary Readings (BF 21.D8) and others in the section titled "Behavior can be controlled." Especially see Boring's article in the same section or in Dulany's Contributions to Psychology (BF 131.D) This tape also relates to Learning and Thinking (Area IV) for which you may want to see:

Lumsdaine and Glaser: Teaching Machines and Programmed Learning LB 1029.A85

Skinner: "How to teach animals" (12/51) or "Teaching Machines" (11/61) Scientific American Reprints.

D 1 2 3 4 5 I 1 2 3 4 5 W 1 2 3 4 5 C

STUDY GUIDE

Intro Text chapter on psychiological basis of behavior. Physiology is very important in psychology although it's not emphasized in "Psychology as a social science." If you find this topic interesting, look for:

readings at the end of the chapter
selections in Scientific American Reprints

In other areas of the course:

on Learning (Area IV):
Reference file folder on physiology of learning
Gerard, R. "What is memory?"
Hebb, D. O. The Organization of Behavior

on Perception (Area III): Hilgard Chapter 8

on Infancy and Childhood (Area VI): Hilgard Chapter 3, pp. 64-74

on Adolesence and Adulthood: Hilgard Chapter 4, pp. 95-102.

D 1 2 3 4 5 I 1 2 3 4 5 W 1 2 3 4 5 C

Louttit, R. Research in Physiological Psychology (Advancing Psychological Science, Volume 4) The production of thirst, mechanisms of memory, electrical self-stimulation of the brain.

D 1 2 3 4 5 I 1 2 3 4 5 W 1 2 3 4 5 C

Olds & Olds in New Directions in Psychology - Physiological relationships in motivation, stimulation of hypothalamus and other areas of the brain.

D 1 2 3 4 5 I 1 2 3 4 5 W 1 2 3 4 5 C

Miller, James: Taped Lecture "General Systems Behavior Theory." Describes a discipline that transcends ordinary academic limitations to consider behavior. A good lecture to hear at the beginning of a course for its interesting point of view, but it may be more understandable later.

D 1 2 3 4 5 I 1 2 3 4 5 W 1 2 3 4 5 C

Film: "New Frontiers of the Brain" Samples of current research and practice assemble for CBS series.

List of Terms and Issues

I. SURVEY AND METHODOLOGY

* psychology, definition

* behavior, definition

  Introspective vs observable data

* operational definition (concept defined in terms of operations used to measure it)

* statement of question, issue or problem for which:

    empirical solution possible

    reformulation needed for testing

    non-empirical statement; test not possible

* experimental vs. naturalistic data collection

* independent and dependent variables

* controlled and uncontrolled variables

* approaches or "schools"

    * behaviorism

    * stimulus-response (S-R)

    * gestalt and field

    * psychoanalysis

* models and theories

* developmental and interactive explanations

The determinism/free will issue is A) important in developing tools for applied problems such as reduction of prejudice, rehabilitation of criminals or prediction of election results; B) interesting as a philosophical debate but has no relevance to psychology; C) no longer of interest in philosophy. Discuss.

Attitude cannot be researched scientifically because it is something inside people which cannot be observed and measured. Discuss.

Does a model have to be true in order to be useful. Discuss. Remember to define your terms.

Will human behavior eventually be explained in the terms of chemistry, biology and physics?

Areas of Psychology

This list is one example of how one psychologist subdivided the domain of psychology. Do not study (memorize) it. I do hope you will recognize these (as areas of psychology) in more general context.

1. Theories and Systems of Psychology
2. History of Psychology
3. Psychological Statistics and Measurement
4. Mathematical Psychology
5. Psychological Tests and Individual Differences
6. Physiological Psychology
7. Psychological Inheritance and Evolution
8. Constitutional Psychology
9. Comparative Animal Psychology
10. Sensation and Perception
11. Learning and Conditioning
12. Thought and Cognition
13. Psychology of Language
14. Motivation and Psychological Dynamics
15. Feeling and Emotion
16. Psychological Aesthetics
17. Personality
18. General Social Psychology
19. Attitudes and Opinions
20. Cultures, Customs and Institutions
21. Behavior Disorders
22. Clinical Practice and Psychotherapy
23. Developmental and Child Psychology
24. Educational Psychology
25. Applied Psychology and Human Engineering
26. Industrial Psychology and Organizational Behavior
27. Psychology of Religion
28. Psychic Research and Parapsychology

SURVEY AND METHODOLOGY

1. Define science, scientist, or scientific method (or all three) in a way which would help you decide which of the following topics could be called examples of the concept (s). Some of the topics may have to be clarified or redefined in the space provided.

Definitions:

science

scientist

scientific method

Topics

astrology

mental telepathy

dowsing (finding water with a forked stick)

psychoanalytic therapy (a technique for treatment of mental disorder)

the study of the soul

the study of the influence of mind over matter

the study of life on the nearest star

2. Which of the following questions are reasearchable or testable, i.e., which could be empirically tested as they are stated? You may want to suggest a test (experiment) to support your opinion.

(yes or no)

____A. Should middle class boys between the ages of three and seven be spanked as punishment?

____B. Can cats tell the difference between major and minor chords played on the piano.

____C. It is better for a college student to study from midnight to 2 a.m. or from 6 to 8 a.m., assuming other factors such as noise in the study room to be the same at both times?

____D. Are bees color blind?

____E. Are middle class adults more socially adaptable than upper class adults?

Comment on researchability (optional):

3. List 2 or 3 ways which animal experiments might contribute to the psychological study of humans. In other words, why use animals for those studies which are intended from the start to be applied eventally to humans?

A.

B.

C.

4. List 2 or 3 arguments for and/or against the proposition that human behavior will be explained eventually in the language of biochemistry. You may want to first define your terms.

FOR	AGAINST
A.	A.
B.	B.
C.	C.

5. In your opinion, what causes behavior, mind or brain?

STUDY GUIDE

II. MOTIVATION AND EMOTION

Fill out the opinion and comment line for each item you use. Circle one number in each of three evaluation columns using these conventions:

D	I	W	C-your comment
1=easy for me	1=interested me	1=worthwhile	
5=difficult for me	5=boring to me	5=no value to me	

* Intro Text Chapter on Motivation
From this chapter you should pick up some vocabulary for talking about motivation, and form some opinions about the different theories presented. Read at least one more reference (about a theory on which you have strong opinions, e.g. you feel it is either the best or the worst.

D 1 2 3 4 5 I 1 2 3 4 5 W 1 2 3 4 5 C

Atkinson, J. W. Introduction to Motivation BF 683 A87. Probably the best integrative work in the field; it traces the historical evolution of concepts of motivation from William James through Freud, Lewin, the behaviorists, and up to today's theories of achievement motivation. The first five chapters summarize and compare major views, with enough well-chosen quotations to give a flavor of the original writings. Plan to spend at least 3 to 5 hours if any on this. Some students recommend skipping directly to a later section giving Atkinson's own theory.

D 1 2 3 4 5 I 1 2 3 4 5 W 1 2 3 4 5 C

Atkinson, J. W. Taped Lecture: "Motivation." In a way parallel to his lecture Atkinson describes the beginning of studies in motivation, and the research he has done in achievement motivation.

D 1 2 3 4 5 I 1 2 3 4 5 W 1 2 3 4 5 C

Murray, Edward J. Motivation and Emotion BF 683 M97. (Foundations of Modern Psychology Series, $1.50) 111 pp. An overview of the area, which integrates theoretical positions with results of the most interesting and important research on motivation. May be useful either in addition or as alternate to chapter from introductory text.

D 1 2 3 4 5 I 1 2 3 4 5 W 1 2 3 4 5 C

Film: "Need to Achieve" Theories of McClelland and Atkinson are demonstrated and discussed.

D 1 2 3 4 5 I 1 2 3 4 5 W 1 2 3 4 5 C

Madson, K. B. Theories of Motivation BF 683 M183. This is an exhaustive comparison of 20 different psychologists' approaches to motivation. If you try it look at more than one chapter for purposes of comparison. Watch for the dimensions along which he describes differences in the theories.

D 1 2 3 4 5 I 1 2 3 4 5 W 1 2 3 4 5 C

STUDY GUIDE

Brown "Achievement Motivation" in Motivations of Behavior BF 199 B88.

D 1 2 3 4 5 I 1 2 3 4 5 W 1 2 3 4 5 C

One of the following three is useful for discussion of free will and determinism.

Boring, Edwin G. "When is Human Behavior Predetermined?" In Dulany: Contributions to Modern Psychology BF 131. D88. In Daniel, Contemporary Readings in Psychology BF 21.D18, Is free will excluded by determinism? Does the concept of free will have any place in psychology? Boring gives his answers to these questions while pulling examples from authors, historians, philosophers and physicists, as well as psychologists. (14 p.)

D 1 2 3 4 5 I 1 2 3 4 5 W 1 2 3 4 5 C

Skinner, B. F. Walden Two $1.50 Macmillan HX 811. Very easy reading; much like a short science fiction novel with a message. Six individuals make a weekend visit to an experimental community in which "Managers" attempt to improve the social behavior of man through carefully controlled environment. Beginning about Chapter 12, Skinner covers every aspect from infant care to marriage counseling in his utopia. Surprise development in the last few chapters.

D 1 2 3 4 5 I 1 2 3 4 5 W 1 2 3 4 5 C

Grunbaum, Adolf "Causality and the Science of Human Behavior" in Feigl and Brodbeck: Readings in the Philosophy of Science in Daniel: Contributions Contemporary Readings... BF21.D18. Grunbaum sets up arguments against determinism and then gives his refutations. In conclusion he argues that moral choices and responsibility, and much of our penal code are dependent on determinism.

D 1 2 3 4 5 I 1 2 3 4 5 W 1 2 3 4 5 C

Atkinson, John W. Motives in Fantasy, Action and Society BF 683: A88. This is a collection of studies and writings which propose assessing a person's motives through analysis of the content of his imaginative thought. Different sections take up validity, method, theory and applications. Chapters 19, 20, 21 and 22 introduce some of the theory and experiments of Dr. Atkinson who is at the University of Michigan.

D 1 2 3 4 5 I 1 2 3 4 5 W 1 2 3 4 5 C

Birch, David Taped Lecture. "An Approach to Motivation." Assuming that new activity is only an extension of old activity, Birch describes an approach that considers motives as only one aspect of the "contemporaneous determinants" of behavior.

D 1 2 3 4 5 I 1 2 3 4 5 W 1 2 3 4 5 C

STUDY GUIDE

McClelland, David D. Studies in Motivation, BF 683.M15. A collection of easy and moderately difficult readings including "Wish-Fulfillment in Dreams," "Notes for a revised Theory of Motivation," and "Motivation of Business and Professional Activities." See the Preface and Chapter 22 for McClelland's description of motivation. One of McClelland's articles is printed in Dulany, p. 215.

D 1 2 3 4 5 I 1 2 3 4 5 W 1 2 3 4 5 C

Birney, R.C. and Teevan, R.C. BF 199 B63. Measuring Human Motivation. A collection of short papers on the problems of method in doing research on human motivation. Contributors include Freud, Jung, and the modern achievement theorists.

D 1 2 3 4 5 I 1 2 3 4 5 W 1 2 3 4 5 C

Berlyne, D. E. Conflict, Arousal and Curiosity, BF 199 B52. A refutation of motivational theories that deal only with biological motivation and psysiological drives. Berlyne presents detailed evidence on the existence of innate exploratory or "curiosity" motives.

D 1 2 3 4 5 I 1 2 3 4 5 W 1 2 3 4 5 C

Packard, Vance Hidden Persuaders $.35. Very easy and enjoyable reading; sometimes shocking if true. Everyone should be familiar with the "popular" literature of psychology, and be able to read it critically.

D 1 2 3 4 5 I 1 2 3 4 5 W 1 2 3 4 5 C

James, William. The Principles of Psychology, BF 121.J27. Vol.II, Chapters 24, 25 26 on Instinct, Emotions, Will. Lengthy and sometimes difficult because of style and frequent quotations. Certainly worth reading. It was written about 80 years ago and is still of more than historical interest. It was just reprinted paperbound by Dover.

D 1 2 3 4 5 I 1 2 3 4 5 W 1 2 3 4 5 C

Nebraska Symposium on Motivation, BF 600.N. An annual symposium that presents the latest theoretical and research ideas of top men in the fields. Author, title and year __________________.

D 1 2 3 4 5 I 1 2 3 4 5 W 1 2 3 4 5 C

Schactel, E.G. Metamorphesis, BF 701 829. What is the difference between happiness and joy? Schactel classifies emotions into two basic categories (the Emergence Affects and the Embeddedness Affects) and then discusses how and why certain emotions should belong to one or the other of these categories.

D 1 2 3 4 5 I 1 2 3 4 5 W 1 2 3 4 5 C

STUDY GUIDE

Gordon, J. Personality and Behavior. Chapter on Motivation stresses need-drive theory and psychoanalysis.

D 1 2 3 4 5　　I 1 2 3 4 5　　W 1 2 3 4 5　　C

Film: "Unconscious Motivation". Short demonstration of behavior under hypnosis and post-hypnotic suggestion.

D 1 2 3 4 5　　I 1 2 3 4 5　　W 1 2 3 4 5　　C

Don't forget there are many interesting articles in collections of readings. For example, in Teevan, R.C. (ed.): Readings for Introductory Psychology, consider

#17 The Effect of Different Intensities of Hunger Drive on Perception

D 1 2 3 4 5　　I 1 2 3 4 5　　W 1 2 3 4 5　　C

#19 Personal Values as selective Factors in Perception (experimental approach)

D 1 2 3 4 5　　I 1 2 3 4 5　　W 1 2 3 4 5　　C

#30-37 Motivation and Conflict section - fairly good (experimental approach)

D 1 2 3 4 5　　I 1 2 3 4 5　　W 1 2 3 4 5　　C

#48 Some Personality Factors in Anti-Semitism

D 1 2 3 4 5　　I 1 2 3 4 5　　W 1 2 3 4 5

STUDY GUIDE

III. PERCEPTION

Fill out the opinion and comment line for each item you use. Circle one number in each of three evaluation columns using these conventions:

D	I	W
1=easy for me	1=interested me	1=worthwhile
5=difficult for me	5=boring to me	5=no value to me

C-your comment

Intro Text chapter on perception. Usually examples are given from optical illusions as well as real world experiences. Don't be concerned with factual or historical detail; read for general understanding of organization and constancy in perception, the nature of research in perception, and the influence of learning, expectations, needs, etc. NOTE: Watch for a note on ESP; it is an intersting issue.

D 1 2 3 4 5   I 1 2 3 4 5   W 1 2 3 4 5   C

Dember, William Psychology of Perception ('60) BF 311. D37
A good textbook in perception. I'll recommend chapter 1, 5, 6 especially and also 7-11. It includes a lot more about organization, context, learning and motivation.

D 1 2 3 4 5   I 1 2 3 4 5   W 1 2 3 4 5   C

Film: "Visual Perception" Demonstration of textbook concepts, especially illusions and constancies.

D 1 2 3 4 5   I 1 2 3 4 5   W 1 2 3 4 5   C

Hochberg, J. Perception (Foundations of Modern Psychology) BF 311 H67. Especially Chapters 1, 2 and 6.

D 1 2 3 4 5   I 1 2 3 4 5   W 1 2 3 4 5   C

Taped lectures:

Weintraub, D. "Issues of Perception."
A general discussion of the problems in approaching the study of perception; interesting question period at the end.

D 1 2 3 4 5   I 1 2 3 4 5   W 1 2 3 4 5   C

Zajonc, R. "Perceptual Defense"
Describes a series of experiments designed to test whether or not a person can suppress recognition of potentially harmful perceptions. Zajonc takes up where Weintraub left off, and the lecture complements the unit on methodology very well.

D 1 2 3 4 5   I 1 2 3 4 5   W 1 2 3 4 5   C

Kaplan, S. "An Approach to Perception"
Brief surveys of the field of perception; concentration on the functional approach, which often is neglected by introductory texts.

D 1 2 3 4 5   I 1 2 3 4 5   W 1 2 3 4 5   C

D.C. Beardslee and Wertheimer Readings in Perception BF 311 B37
Some suggestions, but look for yourself. 8. Wertheimer on organization. 13. Rubin on figure and ground. 36-38 On sound localization, a sample problem. 40. Witkin on importance of individual differences. 50-51. On incongruity and ambiguity.

D 1 2 3 4 5   I 1 2 3 4 5   W 1 2 3 4 5   C

Scientific American Reprints on closed reserve and study room shelf include: Perception of the Upright, Perception of Motion, Experiments in Perception, The Visual Cliff, Moon Illusion, Kohler's "Experiments With Goggles."

D 1 2 3 4 5   I 1 2 3 4 5   W 1 2 3 4 5   C

Kaufman and Rock "The Moon Illusion" Scientific American, July '62. Why is the moon larger near the horizon?

D 1 2 3 4 5   I 1 2 3 4 5   W 1 2 3 4 5   C

Hilgard Chapter 8. The Sensory Basis of Perceiving
I recommend this as interesting and useful for exposure to physiological side of psychology. Color mixing, blending and contrast; auditory perception and music; taste; touch; only 28 pages and with full color pictures too!

D 1 2 3 4 5   I 1 2 3 4 5   W 1 2 3 4 5   C

Morgan and King, pp. 340-373 give a somewhat more technical introduction.

D 1 2 3 4 5   I 1 2 3 4 5   W 1 2 3 4 5   C

Allport, Floyd Theories of Perception and the Concept of Structure. This book takes a theoretical and historical approach to the study of perception. Various theoretical approaches and their historical antecedents are presented. The coverage is quite comprehensive including material on 13 different perceptual theories. The book is organized around an attempt to arrive at a general theory of perception, not by integrating the various perceptual theories already extant, but rather by utilizing the findings taken from these theories to build a new general theory.

D 1 2 3 4 5 I 1 2 3 4 5 W 1 2 3 4 5 C

Gibson, James The Perception of the Visual World QP 419. G45 Introduction and Chapter 5 capsule Gibson's view - or see his chapter in Koch: Psychology: A study of a Science I, pp. 456-501.

D 1 2 3 4 5 I 1 2 3 4 5 W 1 2 3 4 5 C

Fraiberg, Selma The Magic Years, pp. 49-52 and 120-126. You haven't always seen things the way you do now. Fraiberg gives an entertaining glimpse of the world from a small child's point of view, literally and figuratively. (You will want to read more than 9 pages. The whole book is recommended for the section on Development, Structure, and Dynamics.)

D 1 2 3 4 5 I 1 2 3 4 5 W 1 2 3 4 5 C

LIST OF TERMS AND ISSUES

3. PERCEPTION

* constancies in perception (object, brightness, color, shape, size, location)

* organization

figure and ground

grouping and patterning

motion perception

* depth perception

* influences on perception

attention

preparatory set

needs and values

* extrasensory perception

psychokinesis

precognition

mental telepathy

clairvoiance

For the most part do we see what we want to see? (consider motivation, learning and personality)

What steps must one go through in order to prove that ESP exists and can be employed at will by one who really possesses this amazing ability?

How is perceptual research used to design better tools for influencing human behavior? e.g., subliminal perception for advertising, (see Chapter 1 of Dember), perceptual deprivation for brainwashing.

SPECIAL TOPIC

Parapsychology: A list of issues and topics for discussion and a reading list.

This is not intended to be exhaustive but will do to get you started. After a first session for interested students, additional discussion meetings may be arranged. The group can decide whether to go on with discussion, informal debate if enough disagreement is generated, or some more formal investigation such as some experimentation and evaluation. A teaching assistant can assist with meetings and projects.

Topics for discussion in parapsychology:

1. Useable definitions for ESP.
2. Is ESP a meaningful concept?
    a. What can we understand by the term "non-physical science"?
    b. Can the techniques of the physical sciences by applied?
3. What are the results of the acceptance of ESP on other branches of science?
4. Should the parapsychologist establish ties between his area and other disciplines or seek to establish parapsychology as a clearly independent study? Should he use different methods?
5. Can we reject the possibility for study of psi?
6. What is the relation between psi and the more traditional examples of inexplicable phenomena: i.e., witchcraft, seances, ghosts, etc.
7. Strictly from the facts which we can accept as established, of what importance is psi, what directions should further study take?
8. Can tests be devised either for post-cognition or for mediumship?
    a. Can a test be devised to separate these two phenomena once they are established?
    b. If either type of test can be devised using the standard methods of a physical science, can some revolutionary new methods for a non-physical science be developed?

9. Do any new types of psi phenomena suggest themselves? What tests are there for additional types?

Reading list: parapsychology

1. Parapsychology, J. B. Rhine and J. G. Pratt BF 1031 .R484 1962
   Everyone should look this over first and read some part of it. Chapters 3 and 6 include interesting suggestions for further reading.

2. New Frontiers of the Mind, J. B. Rhine, BF 1031 .R48
   First three chapters provide a good general and historic survey. The remainder are reports on experiments at Duke University.

3. Human Personality, F. W. H. Myers, BF 1031 .M9961 1936
   A layman's examination of whether man has a soul which survives death. Supposedly it is scientific rather than religious; anyway it may bring out some problems posed by religion to the researcher conducting a scientific examination of the "supernatural."

4. The Reach of the Mind, J. B. Rhine, BF 1031 .R485 1961
   General background. It deals more with superstition which has been associated with ESP.

5. Modern Experiments in Telepathy, S. G. Soal BF 1171 .S68 1954

6. Suggestion and Autosuggestion, C. Baudouin BF 1156 .P8B343 1954
   An attempt at scientific explanations for strange phenomena, some of which are related to ESP.

7. The Vital Message, A. C. Doyle BF 1261 .D77
   This book appears to be seeking a religious interpretation of psychic experience.

8. Spiritualism Among Civilized and Savage Races, Lawrence BF 1261 .L418
   An anthropological approach to spiritualism.

9. The Mysteries of Hypnosis, G. deDubor, BF 1142 .D82E5 1922
   The description in the card catalogue suggests this might have something in it.

Other books in this area may prove interesting; library shelves include items on crystal gazing, witchcraft, ghosts, etc.

J. B. Rhine supplies extensive reading lists with his publications, especially Parapsychology.

There are some short articles, clippings and student papers in the reference file under "perception."

STUDY GUIDE

XI. APPLIED TOPIC

The purpose of this unit is to be sure you have experience with applications of psychology before the end of the course, i.e., exercises similar to what you might be doing later in the area of psychology.

For some of you it is appropriate that this activity is a simple experiment, or the designing of an experiment. For most it will be an informal paper (or outline) discussing some issue or problem.

Typically students take topics from social psychology (prejudice, conformity, brainwashing and persuasion, group conflict, etc.) or personality (penology, rehabilitation, community mental health) or learning (programmed instruction and creativity, design of self-instruction programs, etc.), but I have set no limits. Examples of student papers from earlier terms are in the reference file under "social issues" or individual topics (learning, assessment, etc.)

Suggested procedure:

1. Look at a few examples from earlier terms. Do not remove an only copy from the study room. You may request to have a copy made for you.
2. Select a topic or issues or experimental problem which may build on earlier student paper, or begin fresh.
3. Inform the instructor in writing as soon as you have selected a topic, even though it may yet be tentative. A statement of at least one half page should be turned in at the end of 10 weeks.
4. Turn in a draft of your paper, experimental design or whatever you choose, as soon as possible for comment well before the final. In any case turn in something at least one week before the final.

The format, topic and treatment are open to your selection, but do discuss your plans with me.

Keep in mind that the purpose is to involve you more in ways you may later be working with psychology. I will look for appropriate use of knowledge, thoughtful analysis, and perhaps synthesis of new ideas in the outline or informal paper you produce.

The applied topic is intended to encourage a transition from (required) classroom activity to everyday (voluntary) activities as a citizen, individual, or perhaps as an advanced student.

Therefore you might consider yourself a member of a school board or PTA committee charged with assembling information on computer-assisted instruction or programed instruction in high school. Or imagine yourself a civil rights worker facing prejudice against you and the people you are working for and trying to shift attitudes and improve the tense social climate. Or you are a senior psychology major planning a research project dealing with "fear."

The following examples may suggest how to get started with a topic of your own choosing. Look also at the papers of previous students filed under unit headings in the reference file. (Not all of them are good examples of an applied project, but most of them are interesting reading and useful sources of ideas and reference.)

Example of a topic for someone interested in social psychology, and in particular, "prejudice." Imagine that you are a civil rights worker in the South. You are having a difficult time getting along from day-to-day. How can you reduce the prejudice expressed against you for intruding into their affairs, prejudice which hinders your work and threatens your welfare? And how can you contribute to the reduction of racial prejudice? Outline what you would do; use relevant methods and concepts that might be found in psychology and related courses under headings such as perception, motivation, learning, personality disorder, attitude and group dynamics.

Example appropriate for someone considering a major in psychology, who happens to be interested in the emotion "fear." You are a senior planning a research topic and are writing an outline (or brief statement) for your advisor and for a classmate to get help in planning your study. What are some appropriate ways to define and study fear. What kind of experimental design is appropriate, or what observations would you make? You may want to limit yourself to particular questions such as the relation between subliminal perception and fear, or between cognitive processes and fear. Many headings are relevant: methodology, perception, emotion, learning, assessment, etc.

SELF-INSTRUCTION PROGRAM

RECORD OF ACTIVITY

Name:______________________________

for the week beginning: ____________________

Give approximate total time and breakdown in categories to the nearest quarter hour. Don't bother to separate out a little writing or discussion which took place during a reading session, or a small amount of time required to find a book before reading it.

Total Breakdown

	Time	Reading	film or tape (or tv)	writing reactions or papers	discussion	tutorial	quiz or problem set	searching or(browsing) for books	Description (author and chapter, name or topic of film, number of quiz, etc.)
MONDAY									
TUESDAY									
WEDNESDAY									
THURSDAY									
FRIDAY									
SATURDAY									
SUNDAY									
TOTALS									

Psych 191-4, Zinn, 67w

PO. STUDENT OPINION AND RECOMMENDATIONS FOR INSTRUCTION

It is a requirement of this course to complete and turn in this form. Leave it in the envelope on the door of room 205 and sign your name on the envelope. If you wish to remain anonymous do not put your name on the form. I must have written opinion from all students before the final exam on Saturday, April 22 at 10:30 am. I will not open the envelope until all grades have been recorded in case this will help encourage your candid and sincere responses.

Submitting opinion of instruction is an important responsibility of each university student; you give opinion more or less effectively each time you advise another student in regard to classes or teachers. Sincere and candid opinion is especially important for this course because your suggestions will be used along with other information to:

1) advise students who are considering a self instruction section;
2) direct SIP students to the more effective materials and methods;
3) improve the strategy of the self instruction program;
4) contribute to research on increased freedom (and responsibility) for students in college instruction.

I hope you will find time to write sincere and thoughtful remarks, including whatever criticism or commendation might be constructive.

This form is given in four parts: general view, specific comments, summary evaluation, and specific recommendations. Most of the items have alternatives for you to check in order to save you time. You may skip those that seem irrelevant. I do not expect you to adequately express your opinion without written elaboration and additional alternatives. Furthermore, I encourage you to discuss your criticisms and suggestions with other students, teaching assistants, or directly with me. Additional comments will be welcome at any time, eg, next fall when you return to school.

I. General view of purposes, material and methods.

Looking back four or five months, why did you enroll in Psychology 191?

__distribution requirement

__counselor recommendation

__just general interest

other:

And why did you elect this special section?

__scheduling convenience

__work at own pace

__select own materials

Other:

Knowing what you do now, would you recommend an independent study section to a friend? __yes __no

With what reservations, warnings or advice?

II. Specific comments, criticisms and suggestions regarding the course purposes and methods.

The attached summary table has proved helpful to some in summarizing their remarks. However, you may prefer to write your own outline or list.

Instruction for filling out the table of objectives and methods on p.4.

1. Cross out those objectives which are not important to you or to your program of study.
2. Add any other objectives, or redefine the ones already there.
3. Add any other methods you have used for study, or elaborate the ones given.
4. In each cell remaining in your modified version of the table indicate the extent to which the method served the objective for you. You may use the following key for a summary notation:

1 : excellent method the this objective
2 : very good
3 : good
4 : some value
5 : no value (or relevance) at all

For example, you might indicate that readings serve the knowledge of content objective very well by writing:

	Knowledge of content	Understanding
Readings	② More efficient than other methods but I need more opportunity to check my information with a teacher.	

Do not be bound by this format; I only want to get the most useful information in some way efficient for you.

SOCI p4 OBJECTIVES METHODS	KNOWLEDGE of content terms facts conventions procedures principles theories (immediate & retained)	UNDERSTANDING translation interpretation extrapolation application	ANALYSIS & EVAL. assumptions reasoning conclusions criteria	SYNTHESIS communication experiment independent thought	ATTITUDES & INTERESTS satisfaction worthwhile continuation (tol:rance?)
TEXT					
READINGS					
LECTURES AND FILMS					
REACTION RECORD					
PERIODIC PAPERS					
DISCUSSIONS					
TUTORIAL					
EVALUATION eg: hour test quiz oral quiz written work					

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AVAILABLE AT TIME FILMED

III. Summary Evaluation

Indicate your opinion of the following characteristics using numbers from the following scale:

1. superior 2. very good 3. good 4. fair 5. poor

The overall value of the course was __

The overall teaching effectiveness of the instructor and his self instruction (independent study) strategy was __

> This judgement is difficult since my intention was not to actively "teach" but rather to supervise, direct and assist you in your own learning.

Particular characteristics of the instructor as they related to student learning in this self instruction environment:

__knowledge of subject matter

__enthusiasm for subject matter

__stimulation of interest

__stimulation of intellectual curiosity

__use of praise and criticism

__personal characteristics (speaking habits, etc.)

other:

IV. Specific recommendations.

As a recommendation for the next time this special section is given, to what extent do you believe the following should be employed? Use this code:
1. extensive use 2. some use 3. no use
Please write in comments also.

procedures comments

__assigned reading

__regular quizzes

__required discussions

__optional discussions

__annotated reading lists

__regularly assigned papers or

__reading log (reaction record)

__assigned film or tape
(as a lecture, perhaps weekly)

__assignment of each student to upper class (or grad. student) tutor

__required weekly conference with tutor (or instructor)

__memos announcing exams, special meetings, etc.

__bulletin board

__open file of reading lists, papers, clippings, etc.

__student comment on materials

__closed reserve shelf

__student responsibility for learning

other procedures:

materials comments

__required introductory text

__chapters from advanced texts

__journal and magazine articles

__films

__tape recordings

__newspaper clippings

__papers of other students

other materials:

space and facilities

__nearer to center of campus

__separation of individual (eg, room 300) and discussion space (eg, rooms 205, 207)

__open to students for longer hours (eg, evenings and weekends)

__separate from facilities for other students, eg, special room in library or in a research building such as CRLT

__self-opening audio-visual equipment

other facilities:

Content of the course

In what order do you beleive these ten major topics should be considered in an introductory course in psychology, (ie, what should a student look at first?)?

__Methodology

__Perception

__Motivation

__Learning and thinking

__Creativity and problem solving

__Statistics

__Assessment

__Personality: Development and theory

__Personality: Disorder and therapy

__Social

How should the content of the course be expressed?

__detailed statement of objectives

__one recommended introductory text book

__list of terms and issues

__large file of examinination items and situations

How much freedom should students have to select their own content, eg, spend all their time on personality therapy and perhaps one other topic?

THE UNIVERSITY OF MICHIGAN

COLLEGE OF LITERATURE, SCIENCE, AND THE ARTS

STUDENT OPINION OF COURSES AND TEACHING

TO THE STUDENT:

The act of evaluating the educational process is not a simple one for either the teacher or the student. However, the faculty has found that both teacher and student benefit from the careful and honest opinions given by our students. It is, therefore, the policy of the College to conduct this inventory of course objectives and teaching procedures every other year. Your thougtful responses to this questionnaire will assist the College in improving the methods and objectives of our common educational endeavors.

FILL IN:

Department and Course Number ______________________________

Section Number ______________________________

Name of Teacher ______________________________

School or College in which Enrolled ______________________________

Class (Circle one): Fresh., Soph., Junior, Senior, Grad., Special

Field of Major Interest or Concentration ______________________________

Overall Grade Point Average at University of Michigan ______________________________

Please do not sign your name.

This form will not be returned to the instructor until after grades have been reported.

Form T625

TO SAVE YOU TIME, READ THE INSTRUCTIONS FOR ALL SECTIONS of this form **BEFORE** you begin to answer any one. This will help you avoid unnecessary or inappropriate answers.

1. What do you think are the objectives of this course **as emphasized by the instructor?** Here is a list of statements which can be used to identify this emphasis as given in most of our College courses. First read through the entire list and then underline as many phrases as you believe represent the main emphasis of this course. Use a double underline for the one, two, or three statements that are especially applicable.

    a) Learning new terminology or vocabulary

    b) Acquiring specific and factual information

    c) Learning rules, procedures, techniques, or methodology

    d) Learning concepts, principles, or theories

    e) Applying facts, procedures, principles, or other knowledge and skills

    f) Analytic or critical thinking; that is, learning to analyze or make evaluative judgments about data, ideas, arguments, or theories

    g) Creative thinking; that is, learning to combine facts, ideas, and procedures, or produce original material

    h) Changing or developing your interests in this field

    i) Changing or developing your attitudes or values

2. Are you satisfied with these course objectives; if not, how would you wish them to be changed?

3. Summarize briefly one of the more specific ways that this course has influenced or changed your interests, attitudes, or values.

4. Ten attributes of instruction have been listed below. For each attribute, circle the word or phrase which is nearest to your impression of this course, i.e., which best describes that aspect of the course **for you.** Where appropriate, give reasons or examples to support your opinion. Not all of the attributes apply equally to each course in the College, so you may wish to make some qualifying comments in the space near each item.

a) The use of class time was:

very effective
satisfactory
unsatisfactory at times

b) The pace of classroom presentation of material, for the most part, was:

too slow
too fast
about right

c) Individual help or further discussion outside of class:

was encouraged by instructor
was normally available
should have been more available

d) The integration of lectures with other course material was:

somewhat lacking
good
excellent

e) The assigned material was on the whole:

too difficult
fine for me
too easy

f) In my opinion the class procedure was:

well organized
moderately well organized
poorly planned

g) The instructor stimulated my interest in the subject matter:

a great deal
somewhat
very little

h) The instructor's enthusiasm for the subject matter was:

strong and sincere
adequate
somewhat lacking

i) The feeling between the instructor and the student was:

somewhat antagonistic
cordial
especially close and friendly

j) The instructor's description, explanation or analysis of the subject matter was:

seldom clear
sometimes clear
consistently clear

5. Keeping in mind that the returns from this questionnaire will be used by the instructor in the process of improving his teaching, please mention **ANY OTHER ASPECTS OF THE COURSE OR INSTRUCTOR** not covered in previous questions which you consider to be especially good or poor. For example, consider any of the following list which are relevant:

text and outside readings
lectures
recitation or discussion
laboratory
papers, projects and examinations
course procedure
instructor

Offer any suggestions that you have for improving this course.